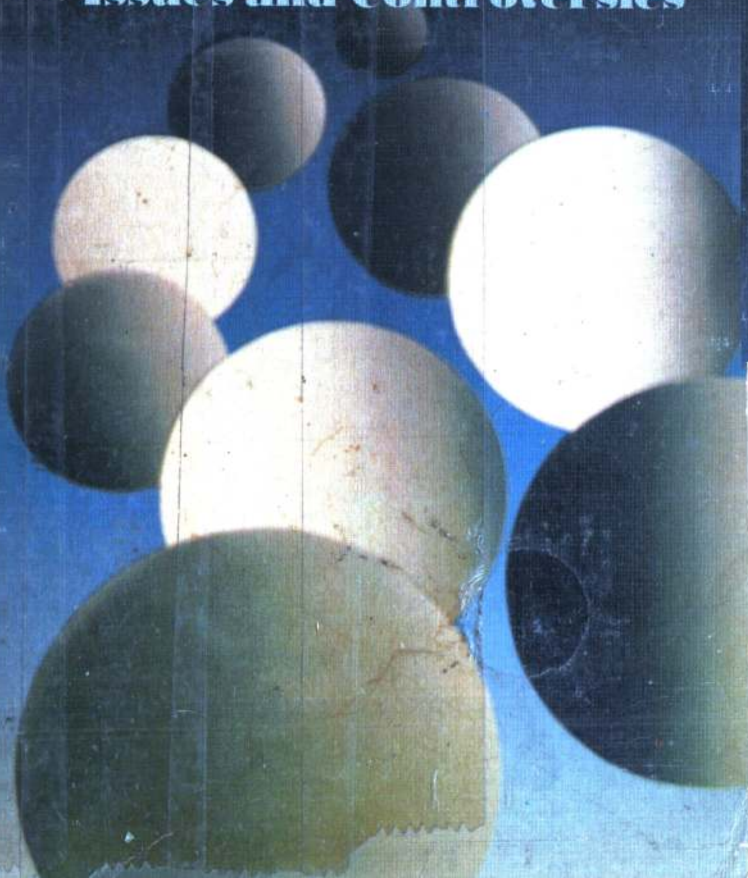
I. FROLOV, B. YUDIN

The Ethics of Science:

Issues and Controversies



The Ethics of Science

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The authors examine a whole set of problems in the ethics of science, the issue of a scientist's social responsibility and the forms and ways of its fulfilment in the context of the scholars' participation in nuclear research, in tackling today's global problems, the ethical aspects of sociobiological investigations, human experimentation and genetic engineering.

The book is written in a polemical style, and addressed not only to philosophers and historians of science, but to all those interested in the life of the scientific community and its relationships with society.

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The Ethics of Science: Issues and Controversies

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Contents

INTRODUCTION
5

CHAPTER 1
A Systems Historical Approach to Science: the Social, Cultural and Conceptual Potential of Scientific Knowledge and Its Functions Yesterday and Today
16

CHAPTER 2
Scientific Cognition and Values: Man as the Subject and Object of Science. The Humanitarian "Dimension" and Socio-Ethical Principles (Regulators) of Cognition
49

CHAPTER 3
Science and Ethics: Alternative or Interdependence? Humanistic Ideals Versus Scientistic and Technocratic Idols. The Ethics of Science and Common Socio-Ethical and Humanistic Values
97

CHAPTER 4
Physical Problems and Moral Dilemmas: On the Brink of Nuclear Disaster? Science and the Global Problems of Human Civilization Today and Tomorrow: New Thinking and New (Real) Humanism
146

CHAPTER 5
Ethics in the Context of Contemporary Biology:
Evolutionary-Genetic Roots of Ethics.
Genes – Intelligence – Ethics.
Social-Biologism: Elitism and Racism
191

CHAPTER 6
Ethical Problems of Human Genetics.
Genetic Engineering: Unlimited Opportunities and Possible Restrictions. Freedom of Research and the Scientists' Socio-Ethical Responsibility
246

CHAPTER 7
Human Genetics and the Debate on the Ethics of Genetic Control. Socio-Ethical Regulation of Scientific Studies
285

CHAPTER 8
Summary and Conclusions.
The Ethics of Science as a New Field of Research. New Problems and New Debates
316

CONCLUSION
352

Name Index
354

Subject Index
361

Introduction

What is the ethics of science? This book sets out to answer this question. It is hardly possible, however, to provide an unambiguous or final answer. But do we have to look for unambiguous or final answers to all questions? For there is a wide range of "eternal" issues in human existence with which philosophy and science have to come to grips but which re-emerge again and again, and every new generation sees them as increasingly urgent issues and offers new solutions to them. These eternal issues are in fact inevitably specific in their historical context. They can therefore be said to remain forever on the agenda of humanity.

Indeed, how are, for example, the issues of the meaning of life, good and evil posed in different times? They cannot be approached with "scientific criteria" as are, for instance, problems in mechanics. But they are no less important in human existence than the latter. The human genius is, in the words of Alexander Pushkin, "a friend of paradoxes". The paradoxes are most acute when humanity addresses itself to these eternal issues, including those which are now referred to as socio-

ethical and humanitarian issues of human life and cognition and are frequently regarded together as the ethics of science. This term does not cover all the aspects of the problem nor does it reflect its specifics adequately. What is more, this term has on numerous occasions been objected to, and with good reason. For the moment, let us leave aside these objections and look at the essence of the matter. Let us take up specific issues in order to get an insight into the very concept of the ethics of science and its scope.

Certain definitions will be needed. To start with, however, we will look at the matter from a different angle: for what reason has the ethics of science, or *the socio-ethical and humanitarian issues in scientific cognition,* acquired such importance that it has become a field of philosophic research? This question is closely related to another: with what specific problems is the ethics of science concerned?

If these important questions are to be answered properly, we should go beyond the framework of analyzing the internal factors shaping the functions and development of science and consider the social conditions under which this process occurs and on which it is essentially dependent. We will see that humanity has never experienced a stage which determined the future of world civilization to the extent our times do. The specific features and conflicts of this stage have been profoundly and thoroughly analyzed in the Political Report of the Central Committee of the Communist Party of the Soviet Union to the 27th Party Congress and in the new edition of the CPSU Programme adopted by the Congress.

The historical development has brought humanity to a qualitatively new point at which the unprecedented technological (and also military technological) progress, the increasing human impact on natural processes, a real danger of exhausting the non-renewable natural resources and numerous other factors, deprive humanity of the right to commit an error. Today, the scale and intensity of unfavourable consequences of any erroneous decisions, as far as the progress of society is concerned, made in some region or by some community, may acquire global dimensions. Therefore any, even the most abstract, calculation which ignores these possible consequences is immoral and anti-humane in the broadest sense of the word.

But humanity must resolve the problems it faces now, and resolve them *flawlessly*. True, mankind experienced ecological crises and devastating wars and other disasters in the past, but even if the consequences were detrimental for some communities, humanity as a whole continued to develop. Today this is out of the question. There is but one way to resolve the problems of today—to concentrate the entire power of science. Even so, this is not all.

Many in the West, including scientists, place the blame for the "uncontrollable explosion" of technological development (war technology in particular) squarely on science. We believe that here philosophical and methodological fallacies have to be separated from political manoeuvring, the sincere concern over the fate of humanity from demagogic stirring of apocalyptical nightmares.

Indeed, science has tremendously increased the social productivity of labour, expanded the scale of production and placed the forces of nature at the service of mankind. Science is the core of the complex mechanism of progress. But it has also given rise to new unprecedented problems and alternatives. In the recent past the technological progress was praised for the overall progress of humanity. Today, the pendulum has swung to the other extreme and many deny the humanitarian aspect of scientific development. The links in the science—ethics—humanism chain which not long ago were believed unbreakable seem to be broken beyond repair. Those who feel this way are convinced that the objectives and aspirations of science and society are now engaged in an unresolvable conflict, that the ethics of today's science are on a collision course with the universal socio-ethical and humanistic principles, while scientific research has long since slipped from under moral controls and the Socratean postulate, "knowledge and virtue are inseparable," has become obsolete.

These people argue that science has no socio-moral role to play as its discoveries are embodied in monstrous tools of mass destruction while a lot of people die of hunger every year. Can a scientist share the universal morals while his findings may be put to most horrible uses, in "extra-scientific" humanitarian terms, proportional to the depth of his penetration of natural mysteries, or the integrity of his work? Can science be described as beneficial when the society in which the specific human personality is alienated and suppressed and its value

is sacrificed on the altar of profit, is largely propelled by science and its achievements?

These questions arise from the objective process of development, but stated in abstract terms they ignore the actual context of capitalist society, for they treat humanism and ethics in general, man in general and science in general. Both science and man do not develop, however, in a void; nor is the technological revolution a non-social concept, a sort of mathematical formula applicable to any time or country. "The question of what goals the achievements of the scientific and technological revolution should serve has become pivotal in the present-day socio-political struggle. Contemporary science and technology make it possible to ensure abundance on earth and to create material conditions for the flourishing of society and the development of the individual. These creations of the human mind and human hands, however, are being turned against humanity itself owing to class selfishness, for the sake of the enrichment of the elite, which dominates the capitalist world. This is a glaring contradiction which confronts mankind as it approaches the threshold of the 21st century."[1]

This dialectical approach does not dismiss contradictions in recent developments, and takes note of negative aspects of technological progress, which may culminate in dire consequences for the whole of mankind. In evaluating the current processes it presumes the dialectic interrelationships of all their components. Along with the problems and dangers we should therefore see

the distinct positive trends which nourish optimism and hope.

The humanistic processes which have surfaced in the social life of our times, such as an increasing interest in man, the desire to perceive the essence and purpose of science in this light, are encouraging symptoms of future desirable changes, although, unfortunately, the impact of opposing processes also becomes stronger. Science, the world scientific community and the world public at large are therefore involved in most complicated, occasionally dramatic, disputes which reflect, though not necessarily adequately, the far-reaching trends in the development of new consciousness and self-consciousness of science and man himself. These trends are increasingly given a scientific description and become objects of scientific reflection as is the case in the development of the methodology of science and the formation of its philosophical and epistemological principles and laws.

Recent years witnessed the high rate of development in the entire world of the *sociology* of science which concentrates on its functioning as an institution of modern society and of the *ethics* of science which studies the principles the scientist abides by in his everyday activities and behaviour in the scientific community and in his interaction with society as a whole.

Issues concerned with the ethics of science and social responsibility of the scientist, which until recently lay in the periphery of the philosophy, methodology, sociology, and history of science, are now the objects of increasing attention. This is espe-

cially true of the ethics of biological and medical research.*

Research efforts in the sociology and ethics of science remain thus far largely uncoordinated; what is more, in many papers the bourgeois scientists tend to separate the ethics of science, as a new line of socio-philosophic and scientological research which has been developing in recent years, from more general social issues dealt with by the sociology of science. By contrast, Marxist research makes a point of considering the ethical issues in science in close relationship with sociological issues. However, the ethics of science has not yet become a field in its own right. In the long term, this weakness will hopefully be overcome and a new integrated discipline, *the sociology and ethics of science*, will develop. Before positive changes occur the tenacious day-to-day work to create the components of this integrated science is needed, its specific features and relevance, its status and promise being viewed in the

* In particular, a team on the ethics of biomedicine has been set up under the Academic Council on Philosophical and Social Problems of Science and Technology of the USSR Academy of Sciences Presidium. In the USSR Academy of Medical Sciences a significant effort has been invested in studying ethical and deontological issues which are the subjects of numerous seminars held in Soviet medical institutions. The findings of this research were reported in special and general scientific publications. In the German Democratic Republic these issues are studied by philosophers as well as by geneticists and medical researchers who discuss them at the widely-known Kühlungsborn Symposia (the tenth symposium was held in 1985). Major issues concerning social responsibility are continuously in the focus of scientific research in socialist countries.

general context of developing philosophical, socio-ethical, and humanitarian investigation of science at large.

Given these specific features, the ethics of scientific cognition may be viewed as a *metascientific* discipline in respect of individual sciences. This view is, however, hardly promising because these issues are in many cases inseparable from specific research. On the other hand, for a philosopher specializing in ethics, the ethics of science looks as an *applied* sphere, which deprives it of its status of a philosophical and sociological discipline and downgrades its broader significance as an essential and permanent component of any field of science.

However, as Vladimir Vernadsky, a well-known Soviet scientist, noted long ago, "the expansion of scientific knowledge in the twentieth century quickly obliterates the boundaries between separate sciences. We tend to specialize in *problems,* not in sciences."[2] This is equally true of philosophical, or socio-ethical and humanistic, fundamentals of scientific cognition. The problems arising here are multifarious and, in a sense, timeless. They are "eternal" issues that have been, since the ancient times, the object of human thought throughout the spiritual evolution of mankind, of its humanistic culture.

Socio-ethical and moral-humanistic problems have no solutions applicable at all times. Nor is there an always progressive development of cognition whereby every subsequent solution would supplement the earlier ones. For this reason, the moral-

humanistic thinking of, for example, Socrates or Kant may prove more significant and relevant than the "maxims" of some modern thinkers. As in many other phenomena of human culture, the special significance of the moral-humanistic problems lies also in their *dialogic* character, owing to which they prompt the subject's spiritual activity making him to experience situations which often do not have analogies or accepted patterns.

Nevertheless, in this field also objective values and laws can be identified which, however, are not rigid. This holds for research into the socio-ethical and humanistic problems of science which, for a number of scientific and social reasons, tend to outline their subject-matter in the framework of today's science as a whole.

One of the basic premises of this book—and we shall try to show that this premise is sound—is that the socio-ethical and humanistic issues are not something *external* in the search for truth and demonstrating their value only in the "technological" *application* of existing scientific knowledge, but rather an *organic part* of the "body" of science, a sine qua non of the feasibility and efficient utilization of the truth. Here science as an integral whole, rather than its separate fields, is implied.

These, probably over-generalized and abstract, introductory remarks will be followed by more specific discussion of some basic issues in the ethics of science. Owing to their disputable and dialogic character we shall have to consider the polemics around these issues which, for all their ambiguity, require a thorough analysis. Special

emphasis will be placed on discussions among Marxist researchers on specific issues in the ethics of science and its status of a separate discipline.[3] This book will expand on what we have written on the subject since the early 1970s in various books, brochures, and articles in Soviet and foreign journals.

Now that the negative, as well as positive, implications of progress in science and technology become increasingly evident, the research in the ethics of science needs significant improvement. This is the task Soviet philosophers should undertake and, according to the CPSU Central Committee statement on the *Kommunist* journal, take the lead in attracting scientific attention to inter-disciplinary problems, "interpreting them in broad conceptual, cultural and historical terms, demonstrating the increasing importance of the socio-ethical aspects of scientific activity".

NOTES

[1] *The Programme of the Communist Party of the Soviet Union.* A New Edition, Novosti Press Agency Publishing House, Moscow, 1986, p. 22.

[2] V.I. Vernadsky, *Thoughts of a Naturalist*, Book 2, Moscow, 1977, p. 54 (in Russian).

[3] See: *Science and Morality*, Moscow, 1971; "Science, Ethics, Humanism", A Round-Table Discussion, in: *Voprosy filosofii*, Nos. 6, 8, 1973; *Science in Social, Epistemological, and Value Aspects*, Moscow, 1980; "Science – Technology – Humanism". A Round-Table Discussion, in: *Voprosy istorii yestestvoznaniya i tekhniki*, No. 2, 1982; *The Technological Revolution and Socio-*

Ethical Problems, Moscow, 1977; M.P. Medyantseva, *The Moral Responsibility of Scientists in the Context of the Technological Revolution*, Moscow, 1977; V.T. Ganzhin, *Morality and Science*, Moscow, 1978; M.G. Lazar and I.I. Leyman, *The Technological Revolution and the Moral Factors of Scientific Activity*, Leningrad, 1978; G.I. Polushin, *The Moral Function of Scientific Activity*, Moscow, 1981; M.G. Lazar, *The Ethics of Science*, Leningrad, 1985 (all in Russian); *Ethical Problems of Science*, Sofia, 1973 (in Bulgarian).

CHAPTER 1

A Systems Historical Approach to Science: the Social, Cultural and Conceptual Potential of Scientific Knowledge and Its Functions Yesterday and Today

The ethical problems have a bearing on many aspects of today's science and on the broad spectrum of its links with social development. Unless science is regarded in this complicated, dialectically contradictory system of interrelationships, the analysis of its ethical issues cannot be complete or plausible. True, certain aspects of these problems can be identified even in discussing some particular features of science. The reader will see that such attempts have been made in discussions on the ethics of science. However, he will also note the incompleteness and inadequacy of the resultant solutions.

The Marxist, i.e., dialectical-materialistic, approach to science, as to any other phenomenon in social life, provides for a *systems* study of the totality of internal and external relationships, conditions

and factors pertaining to it* Science has also to be considered in *specific historical* terms so as to unravel the historical roots of the conflicts at the present stage of its development and identify ways of resolving them. The *systems historical* understanding of science[1] is, in our view, a necessary precondition for the adequate analysis of its ethical problems. First, it warns against making an absolute of these issues by showing that their genesis and the possible solutions stem, in the final analysis, from the socio-historical conditions under which science develops. Second, it demonstrates the depth of these problems and reveals that they inevitably emerge as a result of the development of science and its self-consciousness and are by no means an unessential addition to the internal evolution of science itself, contrary to the belief of scientistically-minded ** adherents of positivism.

* The systems approach in general and to science in particular has been interpreted in various ways, e.g. A.I. Rakitov, *The Philosophical Problems of Science. A Systems Approach*, Moscow, 1977; *Systems Analysis and Scientific Knowledge*, Moscow, 1978; *The Structure and Development of Scientific Knowledge. A Systems Approach to the Methodology of Science*, Moscow, 1982 (all in Russian). A discussion of all these views would divert us from the subject of this book, therefore we will only note that by the systems study of science we imply, above all, the view of science as an integral whole which is part of another entity—society, and itself consists of entities such as social, natural, and technical science. In our treatment of science as a system we rely on the formulations in: *Materialistic Dialectics. A Brief Survey of the Theory*, Moscow, 1980, 1985 (in Russian).

** Scientism is the view of science, especially natural sciences, as the chief mover of social progress.

In effect, a serious analysis of ethical issues in modern science should proceed in the context of (1) the present-day stage of socio-historical development; (2) evolution of science itself; and (3) development of scientific self-awareness, i.e. the changing and ever deeper understanding of the structure and objectives of scientific activities and of their interrelationships with human activities in other spheres of social practice. Combining the three contexts is essential for consistent and systematic analysis of the ethical aspects in the development of science today.

The basic conflict of our times is that between capitalism and socialism. It is felt in some way or another in all spheres of social life, in particular in science. Each of the two opposing social-economic systems makes use of scientific achievements in its own way and this dictates what society expects from science and the way in which it stimulates the development of science. For capitalism science is, above all, a source of new profits and an instrument for maintaining its positions in the world. Hence the corresponding results of the utilization of the technological revolution under capitalism. "Capitalism of the 1980s, the capitalism of the age of electronics and information science, computers and robots, is throwing more millions of people, including young and educated people, out of jobs. Wealth and power are being increasingly concentrated in the hands of a few. Militarism is thriving on the arms race greatly, and also strives gradually to gain control over the political levers of power. It is becoming the ugliest and the most dangerous

monster of the 20th century. Because of its efforts, the most advanced scientific and technical ideas are being converted into weapons of mass destruction."[2]

By contrast, socialism views scientific development as a component in the development of productive forces, economy, social relations and culture. "Socialism has everything it needs to place modern science and technology at the service of the people."[3] Also, because it is a sphere where the essential human powers are applied, science is valuable in itself and has its own significance, no matter how it is applied. For this reason, the socialist society needs the broadest possible development of the scientific and technological potential of its citizens, notably the youth.

The content of scientific knowledge, to the extent to which it is objectively true, is independent of man or humanity. For this reason many important aspects in the search for such knowledge are invariant, being predicated by the objective reality under study, rather than by the time and place of obtaining the knowledge. In the same way numerous phenomena and processes in today's life which owe their existence to the technological revolution proceed in more or less identical fashion under capitalism and under socialism. Marxism-Leninism rejects the leftist conceptions of opposing "bourgeois" to "proletarian" science, conceptions according to which science is incapable of obtaining objectively true knowledge. The struggle against such conceptions which essentially identify science with ideology remains relevant even today because it is not

only a correct understanding of the outlook for social development which is at issue but also the necessary conditions for fruitful development of science itself and for science to maintain its social significance, authority and objectivity.

Today science is associated with the activity not only of individual researchers but also of large institutions which make use of significant amounts of material and intellectual potentials and of the most sophisticated technology and facilities. This alone demonstrates the objective need for society and its agencies to influence the development of science. Indeed, in any field of knowledge scientists may start research in a broad (albeit finite) spectrum of scientific problems. This is equally true of science as a whole. Most promising lines of research must therefore be chosen. In this case, it is especially obvious that the development of science is inseparable from social development and that society can, must and does control the development of science.

It goes without saying that in making a decision on what line of research is to be preferred and where the funds have to be allocated, the opinion of researchers themselves should be heard first because they are most knowledgeable in what problems are most urgent, where the expected results are most promising and can be achieved with the available knowledge, techniques and resources. As a rule, however, their answers do not add up to a final decision because every scientist has his own preferences and views of the situation. Besides, no one can guarantee that the way he proposes is the best one and that he already knows the way to solve the prob-

lem. If it were so, there would be no problem to solve. Finally, the opinions of scientists stem in this case from their idea of the social as well as scientific significance of the research, in particular the benefit of solving the problem for the industry, farming, public health, etc. As a rule, the arguments on possible application of the expected scientific discovery make a strong impression upon the makers of final decisions. This is understandable, for society, represented by the decision-makers on the funding of scientific projects, is entitled to expect the best possible returns on these investments. At the current stage of socialist development in the Soviet Union they are directed at accelerating technological progress for the satisfaction of actual needs.

We have seen that the evolution of science itself necessarily makes its future an object of public interest and is determined by the needs of society, while the needs and interests of society itself and the potential of their adequate expression are dictated by the nature and class structure of society. Consequently, decisions on research matters, which make a strong impact on the progress of both specific lines and fields of research and science as a whole, are shaped by socio-economic and political as well as purely scientific considerations. For this reason, in analyzing an important aspect of today's science, such as ethical problems, one should by no means overlook the fact that science exists in an environment where various social forces confront one another and which is characterized by certain dynamics, trends and stimuli of development.

How do these dynamics affect scientific progress and how does the latter influence social life? The revolution in science and technology is known to increase immensely the contribution of science to the life of today's society, above all, production. Science has become a sphere of activity for large teams. It is significantly dependent on whether its findings are used in a socialist or capitalist way.

What is also important is that science today brings about tangible changes in material production and becomes a decisive factor of social change, growth of education and culture and thus becomes a force facilitating the development of human nature and man's abilities. However, as Karl Marx noted, in an antagonistic class society "even the pure light of science seems unable to shine but on the dark background of ignorance."[4] The Political Report to the 27th Congress of the Communist Party of the Soviet Union emphasized the special relevance of this formulation in our time: "On the one hand, the swift advance of science and technology has opened up unprecedented possibilities for mastering the forces of nature and improving the conditions of the life of man. On the other, the 'enlightened' 20th century is going down in history as a time marked by such outgrowths of imperialism as the most devastating wars, an orgy of militarism and fascism, genocide, and the destitution of millions of people. Ignorance and obscurantism go hand in hand in the capitalist world with outstanding achievements of science and culture."[5] Science still makes little impact, if at all, on the lives of millions. In many instances it widens, not bridges, the

"human gap", as the alienation of man from the results of his activities is sometimes referred to.

While it increases the body of knowledge, science contributes to a greater human alienation which has reached dangerous proportions under capitalism.* In particular, large-scale "scientific production" transforms a human personality into a "partial worker" in the way large factories do. As a result of the application of scientific findings in the context of conventional technologies, all the global problems of today, above all in the society-nature relations, become increasingly acute. The most important argument against science is that it serves militarism and contributes to the arms race which drags humanity into the abyss of a nuclear holocaust. This is why there is a growing fear of science let alone a disappointment in it. In the West science is frequently described as Pandora's box of all kinds of evils. The left-wing radicalist "criticism of science" describing itself as a "counter-culture", expands its influence and becomes a salient feature of the anti-scientistically-minded mass consciousness.

The situation is viewed by some as a "crisis of science" which affects its social and philosophical fundamentals and orientations. However, there are two trends which can lead to the overcoming of this crisis.

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* In particular, the literature in the West discusses the "identity crisis" of man in the rapidly changing world of today where man loses sight of the value of his own personality. See: W.A. Engelhardt, "Science, Technology, Humanism", in: *Voprosy filosofii*, No. 7, 1980.

First, science as a specific kind of activity seems to show an increasing interest in the subject of this activity – man. Once socially alienated, science is acquiring a "human dimension", or associated with human qualities and needs not only "in the long run" – social goals and results – but directly. Man, in the unity of his social and biological qualities, becomes a major object of scientific cognition both in natural and social sciences. The demand that man's specific features be recognized and proper research conditions be ensured by observance of a number of regulations and constraints, makes a significant impact on seemingly neutral instruments of cognition, such as the experiment, and calls for an allowance for numerous factors which, although lying beyond the framework of research itself, actively invade research as objectively necessary ones. In this way, science becomes still more socially dependent, or sociologized; on the other hand, this relationship becomes, as it were, individualized and loses largely its anonymous and alienated nature.

Second, the trend of more distinct and direct "sociologization" and "humanization" of today's science reflects more general processes associated with life by the need to control it along socio-ethical and humanitarian lines on a national, regional and particularly important, global scale. These trends are interpreted and manifest themselves in different ways under capitalism and under socialism, and their inherent contradictions seem to provide the deepest possible insight into the specifics of the development of science today. Of course, not only institutionalized control and management are

meant here, but also socio-ethical and humanistic principles having a regulating role to play in the awareness and self-awareness of the scientists and their morals. In philosophic terms this regulation is referred to as the conceptual orientation of science and scientists. Here new phenomena, occasionally directly opposite to what was until recently observed, come to the fore.

As a rule, this new situation is attributable to numerous internal changes in science (in particular, in methodology this is seen in the rejection of neo-positivistic attitudes which reduce the potential of scientific cognition), and to the new understanding of the role science has to play in the sphere of culture. The latter trend is most obvious in the criticism of scientism which advocates the absolute value of the scientific-and-technological approach to the solution of basic human problems as opposed to the social, humanitarian approach. C.P. Snow, a British novelist and scientist, once described the two approaches as two alternative cultures, one scientific and technological and the other artistic and humanitarian.[6] Discussions of these issues in the Soviet Union have exposed the inadequacy of scientism and technicism, its extreme, and revealed the need for a more organic development of culture which would incorporate humanitarian spheres, the interaction of science and art, and, what is essential, the need for a *science of man* as a social and individual being. The latter is all the more important because technicism, as well as scientism, while superficially "tolerating" an interest in arts or politics viewed as "hobbies", haughtily reject the humanities and cul-

ture as a whole, this being the anti-humanistic, anti-cultural significance of scientism and technicism, which grows with the authority of science in society.

Another important fact is that in numerous non-Marxist approaches, both the adherents and the opponents of scientism treat science as a self-identity, a phenomenon which does not change historically. True, they do not deny that the body of scientific knowledge is continuously on the increase; furthermore, they set hopes upon its growth because for the adherents of scientism all unresolved problems facing humanity exist only as long as the body of stringent and accurate knowledge provided by science is still insufficient.

However, these approaches neglect another aspect in the dynamics of science—its development as a social institution. Implicitly or explicitly, the contribution of science to the life of society, although admittedly increasing, is assumed to remain essentially the same in qualitative terms. Therefore let us take a closer look at the social functions of science changing in the history of society and science itself.

Above all, the shaping of science as a social institution is, apparently, far from completed; today, at any rate, the social functions of science develop and expand at a fast pace and science enters ever new relationships with other social institutions and acquires new social functions.

As a social institution science enjoys a degree of autonomy. The activity of a scientist is pursued and evaluated in terms of specific social criteria, and

many of them, insofar as they play a regulatory role in respect of his research proper, operate and are perceived as methodological standards. These standards are applied to scientific activity in two ways. First, they organize the cognitive thinking acting as a sort of compass in the ocean of the unknown. They act as benchmarks tested by the preceding practice of research. Consequently, they can be described as specific technical standards of scientific research. As such, they are studied by the methodology of science. On the other hand, the methodological references also regulate the interaction between scientists because observance of these references enables the colleagues to estimate the research findings. A more or less orderly system of such references specified for a given scientific field forms the framework for the associated scientific community to shape. As an instrument of creating and maintaining links between individual scientists the methodological references are becoming the object of an increasing amount of research projects in the sociology of society. All the above refers, of course, to general directions in scientific development.

Science also has specific instruments for communication and interrelationships between individuals who jointly make its functioning possible, a specific type of motivation and evaluation of the activities of every participant. The cooperation of scientists which is steadily reproduced by each new generation would be out of the question if there were no system of ethical standards regulating relations between scientists.

As far as the external aspects of the functioning of science as a social institution are concerned, its autonomy would, in theoretical terms, make it impossible to define and explain its specific features and laws on the basis of general sociological laws and principles alone. At the same time, like other social institutions, science reproduces in its own ways some aspects of the life of society as a whole, and reflects with particular clarity and even shapes, to some extent, certain essential needs, trends and lines in the development of science.

The Marxist view of science as a social institution is in sharp contrast to the vulgar sociologistic interpretations of science according to which its essence is merely in serving purely pragmatic goals while its cognitive functions and its own value as an organic part of human culture is utterly neglected. Not only does this interpretation imply that science was established at someone's will for a certain goal which had been specified in advance; more importantly, this simplistic view underestimates the specific nature of science as a social institution which, once it has emerged, is governed by its own laws and is driven by its own as well as exogenous impulses.

The very question, "What is science for?", presumes a certain approach to science, an approach which may be described as functional and which we regard as inadequate. Numerous answers may be advanced and every single one of them may have at least a grain of the truth in it. But the question itself essentially implies a certain specific purpose and therefore the limited role of science as a com-

ponent of a social entity. Science is, however, known to have performed at various stages of its evolution and in various conditions various groups of functions, rather than a single particular function. There is hardly any group that can be identified as representing the true nature of science. What is more, even if the totalities of functions performed throughout its history are added up they would not cover the entire spectrum of its potential. For this reason, science should be understood as a form of life and development of culture which has its own internal significance as well as external causality. It is true that science serves (or at least is supposed to serve) society and man; but science is also a field where social man realizes his powers, talents, and aspirations. We insist upon this because the interpretation of science and, consequently, the mechanisms of its interrelationships with other social institutions, affects the very possibility of stating and discussing its socio-ethical issues in a serious way. If scientific knowledge and the activities of scientists are viewed as a mere instrument of technological progress, then there is not much point in discussing the social responsibility of science. If this were the case, only those who make decisions on how technology should develop could be responsible, science having only to meet the demands and perform the tasks thus formulated. This interpretation disregards the entire multifarious inner content of scientific activities.

Science does serve various needs of society. However, this is only possible as long as science is aware of these needs as its own internal stimuli. Science

can perform certain social functions only as long as it exists and reproduces itself in society but does not dissolve in society or lose its own specific features. Like any other social institution, science reflects in its own ways the trends and conflicts of social development. Thus, it cannot be viewed as something historically invariable in its social and human manifestations or something invariably self-identical. In his time, V.I. Lenin derided the reasoning of Populist sociologists on "society in general" and "progress in general". This can be extended to science – there is no "science in general" and today science is quite different from what it was a century or even half a century ago. As far as the content and the size of the body of knowledge are concerned, this is quite obvious, but this is also true in that science has greatly developed socially and acquired new functions. As a result, its appearance and its relationships with society have significantly changed. Science may be said to be dynamic in two ways: the dynamics of continuous search for new knowledge and a critical view of the existing knowledge are intertwined with the dynamics of its social development as a highly mobile institution of today's society. The dynamics of science reflect, and to a certain extent add to, the dynamics of society where it has a major role to play.

Vis-à-vis other social institutions, science performs three kinds of functions: (1) cultural and conceptual; (2) directly productive; and (3) instrumental in resolving various problems arising in the course of social development. The sequence of this list essentially reflects the historical process of the social functions of science taking shape and expan-

ding and emergence and consolidation of ever new channels through which it interacts with society.

When science was in the making as a social institution, at the time feudalism was in crisis, bourgeois socio-economic relations were conceived and capitalism was born (the Renaissance and early modern age), its impact was felt, above all, in the sphere of the world view shaping where it was opposing theology.

In the Middle Ages theology had won the position of the supreme authority on radical issues in the world view such as the structure of the Universe and what man is in it, the meaning and ultimate values of life. Science which was then emerging was supposed to deal with issues of a more specific and "down-to-earth" nature. In conformity with the concept of dual truth, developed in the depth of scholastic theological thinking, theology dealt with most cardinal and "sublime" matters which were to be solved by revelations, in the utterances of authorities whereas the knowledge of mundane things around man was of no interest to it.

This division into "spheres of influence" left some latitude for the development of scientific knowledge although sooner or later science was bound to break beyond the boundaries which were imposed on it by the religious world view (science has never been inclined to stay within imposed limits). The first occasion of this kind was, as we know, the heliocentric system developed by Copernicus. The first bitter conflict of science and theology was to an extent accidental. If the geocentric system had not been a major building block of Christian teaching,

the Sun-Earth relations would not have become the cause of controversy, for theology of later days did restructure its theoretical schemata to make them "invulnerable" to arguments derived from empirical, experimentally tested facts. At that time, however, the conflict happened to break out in astronomy although it could occur anywhere along the broad theology-science boundary.

By the Copernican system, science for the first time challenged the monopoly enjoyed by theology in world view shaping. This was the first step in the penetration of scientific knowledge and scientific thinking into the structure of activities performed by man and by society. It is in this field that science showed the first signs of breaking from its pale into the world of human thought and aspirations. Scientific work which until those times seemed (and actually was, to an extent) something akin to alchemy or astrology and a preoccupation of isolated individuals, suddenly aroused a lively public interest. There was still no question of science making headway into the everyday thinking of the broad strata but since then science was seen by educated people as an independent sphere of activity and as a worthy occupation; in more general terms, the institutionalization of science began.

The Copernican theory was a very important but still one of the first steps in science winning the key positions in the shaping of the world view. Much time had to elapse which had witnessed numerous dramatic events such as the burning of Giordano Bruno at stake, Galileo's disavowal of his findings, ideological conflicts brought about by Darwin's the-

ory of evolution, before science could act as the final authority in issues of the primary conceptual importance and related to the structure of matter and of the Universe, the essence of life, and the origin of man. Still more time was needed for the answers suggested by science to these and other questions to become an element of general education. Otherwise, scientific ideas would not have become a component of social culture and the language of science, a universal language* of communication for people of different nationalities, races and creeds. Science had to proceed along this tortuous path to assume the *cultural and conceptual function.*

This experience which enabled science to win a position of authority in the sphere of culture is a component in the general process of the development of science and its ties with the life of society. As its cultural and conceptual role increased, new evaluations of science inevitably took shape in the public consciousness and in its own eyes, as regards the meaning and objectives, and social significance of scientific activities. This is most vividly expressed in the ideas of the Enlightenment. Before, scientific knowledge was viewed as something accessible only to the elite who are to benefit from this knowledge; the Enlightenment significantly expanded the framework of the social impact of

* Universal, not in the sense that it makes it possible to express any content or discuss any problems and so has to oust all other languages, but in the limited sense that the message which can be expressed in it will be essentially understood similarly and adequately by people who do not share the same experience or value orientations.

science. The representatives of the Enlightenment believed that ignorance and superstitions were the main source of all evil in society and that dissemination of scientific knowledge among the broad strata of the population was the decisive means to achieve social justice and a reasonable social order.

They did not see or look for material forces which would lead to a perfect social order. They were confident that the light of scientific knowledge would by itself blaze the trail to a restructuring of society along the lines of reason, good and justice.* With the general disappointment in the results of the Great French Revolution of 1789-1794, the ideology of the Enlightenment started to lose ground. Nevertheless, the view of scientific knowledge as a socially significant benefit in itself, a view which took root in the ideology of the Enlightenment, remained for a long time an undisputed premise in discussions of the social role of science. In other words, expansion of the body of scientific knowledge seemed a goal which did not need any exogenous justification and the call for an "absolute freedom of research" was never in doubt. Any objections were greeted as obscurantism. Occasionally the cultural and conceptual potential of science was declared an absolute value. In particular, it was argued that only scientific (more precisely, natural scientific) knowledge can be a reliable

* Jean-Jacques Rousseau believed that the development of science and art did not promote better morals but his view also remained within the framework of theories which were confined to the recognition of the cultural and conceptual role of science and scientific knowledge.

guide in human activities. In this way the importance of such forms of social consciousness as art, philosophy, and ideology in the shaping of the world view was denied. These views were later to develop into scientism which regards science as the sole worthy form of culture and dismisses anything which does not fit the narrowly understood framework of scientific rigour and rationality.

From this brief historical review, numerous questions seem in order. First, does science continue to perform the cultural and conceptual functions today? The answer seems obvious: this role of science and the significance of science for determining the future development of humanity are only increasing. Today, however, it is obvious that science alone is insufficient, that it has to combine with other forms of culture although much remains to be done to achieve this kind of unity. What is more, the understanding of this unity and ways to achieve it is by no means unambiguous.

Second, does the type of scientific self-awareness prevail which stems from the views, dating back to the Enlightenment and even earlier times, that science is a force which affects the life of society only insofar as the cultural and conceptual aspects are concerned? This time again the answer is positive: this view is still fairly strong. Its adherents reduce, for instance, the responsibility of scientists and science before society to responsibility for accuracy and plausibility of scientific findings.

Finally, does this type of self-awareness correspond to the actual status of science in society? The answer must be negative. Because in the context of

today the cultural and conceptual function is only one aspect of the impact made by science on society. The emphasis on this function alone would lead to a narrow understanding of the science-society relationship and obscure the issues of the scientist's social responsibility in all their depth, contradictions, and drama by treating these issues superficially. Consequently, only superficial solutions might be offered.

When this type of scientific self-awareness was coming into being, it expressed the humanistic anti-dogmatic trends and this explains its attraction even today. In the essentially new environment, however, blind adherence to this position proves to be but a kind of dogmatism. By rejecting serious discussion of social responsibility or confining it to credibility of research findings, the supporters of this view are defenceless in the face of those social forces which utilize science for anti-human purposes and for enslaving humanity. If the humanistic content of science is to be kept alive, its relationships with society must obviously be viewed in a wider context which would reflect the actual significance of science and which is largely dictated by its function as a *direct productive force.*

The present-day generation tends to believe that this is the primary function of science and its close ties with technology are viewed as a matter of course. This view is understandable given the unprecedented scale and rate of today's scientific and technological progress which makes its influence felt in all spheres of life. Historically, however, this was not always so. The process of science becoming

a direct productive force was originally noted and analyzed by Karl Marx in the mid-nineteenth century when the synthesis of science, technology and production was more of a promise than of a reality.

At the time when science was in the making as a social institution, material conditions were ripening for this synthesis, an intellectual climate favouring this development was setting in, and the appropriate way of thinking formed. The theoretical science of new times, notably theoretical natural sciences, coexisted with the "mundane" science – a totality of empirical rules, technological recipes and standards of artisanship. This latter "science" (more precisely, know-how for various kinds of activities) developed to meet various needs chiefly utilitarian ones, but also esthetic (such as stylistic) and even moral requirements. These were not, however, the specific theoretical criteria which science has to satisfy.

True, at those times scientific knowledge was not isolated from technology either, but their relationship was obviously a one-way street. Some problems arising in the development of technology became objects of scientific research and even gave rise to scientific disciplines, such as hydraulics and thermodynamics, while science itself had little to offer to technology, medicine or farming. Science, with its insufficient knowledge, was not alone to blame, for practice did not, and felt no need to, rely on the achievements of science or at least take a systematic note of them. On the whole, until the mid-nineteenth century the findings of science led to actual applications but on rare occasions, which

did not contribute to general awareness and rational utilization of the tremendous potential offered by scientific research.

With time, however, it became obvious that the purely empirical basis was too narrow and limited for continuous technological progress, for the development of productive forces and means of production. In looking for a source which would ensure a reliable inflow of technological innovations, engineers and inventors turned to scientific knowledge. Fairly soon, the apparently abstract research was found to yield specific and tangible results which could be measured in quantitative terms. There developed an awareness that science could act as a powerful catalyst for continuous improvement of the means of production, a process which was already underway and becoming increasingly essential. This awareness dramatically changed the status of science and also was a significant impetus for its inclination towards practical application in material production. Characteristically, in this field, like in the cultural and conceptual sphere, science did not remain an auxiliary and fairly soon revealed its potential as a revolutionizing force which could change the nature and pattern of production. As early as the late nineteenth century new industries, such as pharmaceutical, electrical, fertilizer and pesticide, sprang into existence where the achievements of science were directly applied.

These new functions of science still needed social recognition. For even by the early twentieth century, the relationships of science and production developed on a broad but still not very reliable

basis. In some cases, engineers succeeded in extracting from the store of scientific knowledge what was necessary to solve a specific problem; in others, scientists would identify an effect which could be profitably applied without much trouble. Science and technology interacted in a purely superficial way—their relationships were not institutionalized, or socially organized, and proceeded as a combination of lucky finds.

In the twentieth century, the mechanism of free search (which until today remains a powerful source of scientific discoveries which lead to the emergence of new or to a radical restructuring of the existing industries) was supplemented by a new kind of scientific (or scientific and technological) activity—applied research and development. Numerous scientists were employed in the laboratories and design departments of factories and companies where they were to solve various specific problems stemming from the need to improve the technology rather than from the logic of development of a scientific field. Scientific knowledge is now vital not only for the technological progress in general but for the rationalization of specific production spheres and improvement of the technical and economic efficiency of specific factories and industries.

The establishment of permanent channels for the utilization of scientific knowledge (and other spheres in and outside material production followed suit) had significant consequences for both sides. In addition to a powerful incentive for its own development, since "the application of science to immediate production itself becomes a factor

determining and soliciting science",[7] it also acquires organizational forms that significantly facilitate the introduction of its findings in practice. For its part, practice increasingly relies on stable and continuously expanding ties with science. For today's production (and not only for it), scientific knowledge which can improve its efficiency is more than desirable, as an ever broader application of scientific knowledge becomes a vital condition for the very existence and reproduction of numerous kinds of activities which do not owe their existence to science at all, let alone those which were conceived by science. Very much in the life of society now depends on scientific knowledge, both available and yet to be discovered.

In effect, as it is becoming a direct productive force, science is being transformed into an increasingly essential source of means for practical activities. These functions are certainly reflected in its self-awareness, although by no means mirror-like, the more so that the very process of science becoming a productive force and its interfacing with technology and production seems only to be gaining momentum now.

The role of science as a productive force is reflected in its self-awareness in two ways. On the one hand, some scientists proceeding from the immense potential of science in providing an inexhaustible variety of means and tools, believe that the progress of science and technology in itself, out of the context of social conditions, can resolve all social and human problems. This approach, in which an absolute value is attributed to the poten-

tial of science and technology, is very attractive for technocratic concepts. On the other hand, the involvement of numerous scientists in applied research and development, the industrialization of science and its becoming a sphere of activity where masses of people are employed, are on many occasions seen as the reduction of the social role played by science and scientists who become small cogs in the gigantic mechanism of production. As a result, the inherent value and significance of scientific activities per se are rejected, and the humanistic ideals are viewed as the outdated heritage of the "small science" of the past, which has nothing whatever to do with the great science of our time.

On the whole, both views are simplified because, of the entire variety of science-society interrelationships, they consider only science-technology links. For this reason, the counter-science movements seem perfectly in order, which for some time went hand-in-hand with and even ousted the above patterns of scientific self-awareness from the public consciousness in capitalist countries. Whereas the adherents of these views tend to diminish or deny the existence of the social responsibility of science, the counter-science movements exaggerate this responsibility and blame science for all the conflicts and troubles tearing bourgeois society.*

* *US News and World Report* described in its May 19, 1986, issue the results of a poll according to which the percentage of Americans who believed that science did more good than harm fell from 83 to 72; of these approximately every fourth felt that in twenty years the picture would reverse and science would do more harm than good.

This approach seems equally simplified. To be adequately self-aware science should recognize both its cultural and conceptual functions and its functions as a direct productive force. This is equally important for the ethical problems confronting science today to be understood correctly.

The extension of functions of science as a productive force in the context of the technological revolution entails their qualitative changes. As noted above, scientific knowledge combined with technology is used to create various means and instruments for production and other activities. The scientistic metaphysical thinking tends to interpret this fact in the sense that, being allegedly confined to the sphere of the *means*, science has nothing to do with the resultant *ends* of the activities in society, or with the goal-setting. Scientific activity is therefore understood as something socially neutral and so is said to be inherently passive vis-à-vis the exogenous forces which may use it for evil or good purposes.

However, the actual relation of the ends and means in the activities of man and society is dialectical. The ends pursued by society or a social group are generated by the course of historical movement. In setting goals society relies on the available means. Marx noted that "mankind thus inevitably sets itself only such tasks as it is able to solve, since closer examination will always show that the problem itself arises only when the material conditions for its solution are already present or at least in the course of formation".[8] Consequently, the nature, scale, purpose and goals of

human activities are dependent to a decisive degree on the material conditions that have been developed during the history of human evolution. While the ends dictate the choice of means, the totality of available means determines the range of realistic goals.

In effect, science as a source of various means contributes to the definition of goals by society; in other words, it acts as a *social*, as well as a productive, *force*. This is most vividly revealed when scientific data and method are employed in devising large-scale plans and programmes of social and economic development. Direct participation of scientists is essential in formulating every such programme which defines, as a rule, the objectives of numerous factories, agencies, and organizations. What is also important is that because of the integrated nature of such plans and programmes, their formulation and implementation demand the interaction of social, natural, and technological sciences.

In the USSR, science was first initiated in this function when integrated studies of the Kursk magnetic anomaly, the Kara-Bogaz-Gol Bay, and the productive forces of the Soviet North were launched in the framework of a plan of scientific and technological activities, outlined by Lenin. These projects were to solve both economic and social tasks. "They were not only to study the natural resources of those regions but also their economic specialization and the economic potential, the ethnic and social composition of the population, and the cultural and historical traditions."[9]

This integrated approach which employs scientific methods and data in solving large socio-economic, scientific, technological, cultural and educational problems, has been widely applied in the second half of the twentieth century. Development of methodologies for the compilation and implementation of comprehensive programmes has acquired a large scale, as well as operations research, the decision theory, the programme-objective method in management, systems analysis, the planning—programming—financing procedure.

Science performs an important social function in solving the global problems of today, for instance, the ecological problem.

The rapid scientific and technological progress is undoubtedly a major cause of dangerous phenomena such as the depletion of natural resources and the increasing air, water and soil pollution. Science may therefore be legitimately regarded as being largely responsible for the radical and by no means innocuous changes in the environment. Scientists do not question this, either. Moreover, they were among the first to alert public opinion, political leaders and industrial managers to the symptoms of the looming crisis. Science-supplied data have a leading role to play in determining the scale of ecological hazards.

In this case, science does not confine itself to the development of means for arriving at goals which were set exogenously; on the contrary, it detects the problem which is primarily social and is the concern of all, and only by virtue of this a scientific problem. Science not only amazes man with its mys-

teries or serves him with fruits of its discoveries or attracts him by its promise, it also makes him feel concerned over the future and urges him to make decisions and act. The genesis of ecological hazards, their detection, first formulations of the problem and its subsequent updating, the setting of goals for society and provision of means for achieving them — in all these developments science had a hand.

These newly emerging functions of science cannot but tell on its self-awareness. In face of these, the simplified views which concentrate on the cultural and conceptual functions of science and those which regard science and scientific knowledge in a purely pragmatic light as a tool to solve techno-economic problems, appear particularly inadequate. The scientific and technological revolution leads society as a whole, and science in particular, to a choice of either a passive adaptation to progress in science and technology by assuaging, as far as possible, its negative consequences or active influence on its course by turning it into a mainstream of social progress and development of the personality. Progress of science and technology is certainly an essentially social phenomenon; its rate and direction are dictated by the laws of life and development of society. In some cases, however, these laws operate spontaneously, whereas in others, society can make a tangible impact on progress in science and technology by transforming it into an integral part of its own development and minimizing and, ideally, eliminating its negative consequences.

In effect, in the context of the technological revolution the cultural and conceptual functions of

science converge and even merge with its function of a direct productive force; as a result, all its social functions change qualitatively and science becomes a social force. As such science makes a comprehensive impact on public life, notably the techno-economic development, social management and conceptual institutions.

Many thinkers in the past expected science to give answers on the meaning of life, the place of man in the world, and the right order of human life. Today the conceptual role of science lies in that its evolution and penetration of the life of society and man's inner world largely dictate the specific context and form of discussing these issues in our times. The impact of science on man and society makes the background against which these eternal questions are especially relevant. Having penetrated the structure of human activity, as it were, from "below", at the level of the means, science took root there and fairly soon began to influence the very bases of human activity. The participation of science is now not at all confined to the stage where the essence and goal of activity have been specified and it is only required to find the appropriate means; science also influences the very definition of the essence and choice of the goal. This penetration of science into the life of society does not signify that it takes root in various spheres of human activity and ousts their own specific content, although such views exist today in various shapes, from the treatment of art as a way to transmit information or downgrading art to an instrument for the de-

velopment of the scientist's creative imagination, to limiting the functions of philosophy to analysis and interpretation of the latest findings of particular sciences, i.e. to facilitating the accumulation of specific scientific knowledge.

There is no need to go to extremes in order to state the essential significance for man and society of the social functions science performs in the world today. This implies, in addition to the fact that scientific development leads man to face socially significant problems, that it is vitally necessary to assess this development on the whole and its particular manifestations in terms of the interests of man and humanity, in terms of social responsibility of science and scientists for securing these interests. The broader and more diversified the social functions of science, the deeper the awareness of scientists and the stronger the impact on public opinion, the more important for the development of science is the discussion of philosophic, humanistic and social-ethical aspects of scientific knowledge and scientific activity.

The Marxist-Leninist conception of science as a social institution is very far from both scientistic, technocratic approaches and from the narrow anti-scientistic "critique of science" currently widespread in the West. This conception becomes the theoretical guideline of the scientific and technological policy under socialism, which combines into an integral whole economic, socio-political and cultural factors while the integral development of man himself becomes the goal and a major factor of progress.

Consequently, the emphasis should be placed on a deeper insight into the importance of today's science in a broad social context, identification of its human dimension and analysis of the ensuing new problems that would require new solutions, probably, unprecedented in the history of science and technology, which would contribute to the accelerated progress of science and technology.

NOTES

[1]See e.g. *Man – Science – Technology*, Moscow, 1973; *Socialism and Science*, Moscow, 1981 (both in Russian).

[2]Mikhail Gorbachev, *Political Report of the CPSU Central Committee to the 27th Party Congress,* Novosti Press Agency Publishing House, Moscow, 1986, p. 11.

[3]Ibid.

[4]Karl Marx, "Speech at the Anniversary of *The People's Paper*", in: Karl Marx, Frederick Engels, *Collected Works,* Vol. 14, Progress Publishers, Moscow, 1980, pp. 655-56.

[5]Mikhail Gorbachev, *Political Report of the CPSU Central Committee to the 27th Party Congress*, p. 10.

[6]See: C.P. Snow, *The Two Cultures: and a Second Look. An Expanded Version of the Two Cultures and the Scientific Revolution*, Cambridge, At the University Press, 1965.

[7]Karl Marx, "Economic Manuscripts of 1857-58", in: Karl Marx, Frederick Engels, *Collected Works,* Vol. 29, Progress Publishers, Moscow, 1987, p. 90.

[8]Karl Marx, *A Contribution to the Critique of Political Economy*, Progress Publishers, Moscow, 1977, p. 21.

[9]P.N. Fedoseyev, "Philosophy and Integration of Sciences", in: *The Methodological Aspects of Interaction of Social, Natural, and Technological Sciences*, Moscow, 1981, p. 18 (in Russian).

CHAPTER 2

Scientific Cognition and Values: Man as the Subject and Object of Science. The Humanitarian "Dimension" and Socio-Ethical Principles (Regulators) of Cognition

We have thus far discussed primarily the social and conceptual functions of science which express its involvement in the everyday life of society and in numerous basic problems facing humanity today. Now it would be proper to take up the relationship of scientific cognition directly with man as the subject and object of science and thus consider the value aspect of scientific cognition, its human "dimension" and the principles which act as regulators of cognition. Those views of scientific cognition which tend to disrupt this relationship significantly reduce the scope of the discussion of ethical issues in science, or even make it utterly impossible. For this reason, a constructive analysis of these issues and of discussions concerning them requires that the specific nature of the relationship between cognition and values be examined.

To start with, scientific cognition is *an activity which can be carried out only by man*, who may be

equipped with most sophisticated technology and be a member of a large team. This seems self-evident but a number of important corollaries follow.[1] The first immediate conclusion is that knowledge in general and scientific knowledge in particular can be obtained only through the ways and means which are determined by the human nature and intellectual and psychophysiological features such as the size of memory, the structure and power of the sensory organs. True, people differ in these characteristics which can, moreover, be largely developed by education and training. It is equally common knowledge that man has developed various technical facilities which enhance his cognitive potential. Nevertheless, in generating knowledge, its content, being "correlated" in one way or another with the specific human cognitive apparatus, must by all means be reduced to this apparatus as to a common denominator, or, in other words, it must be commensurable with man and his powers.

This feature of scientific cognition is dialectically related to the existence of facts independent of the subject. This implies, however, that in its fundamentals, in its origins, knowledge cannot exist outside man. Instances of externality and alienation of knowledge should therefore be associated with the specifics of its functioning in the actual social context (for example, when people perceive it as it is embodied in incomprehensible technical devices or social institutions, i.e. when the path from the act of cognition to the material embodiment of its results is obscured and they face knowledge already embodied in objects).

Another important conclusion is that scientific cognition, or research, as a kind of human activity, is always an activity of a *specific* subject, and, moreover, an intellectual activity which in its utmost forms requires investment of all the creative powers of man and his cognitive abilities.* New knowledge is always a step beyond what has been known, which cannot be made by the cognitive abilities alone but only by man as an integral being who employs these abilities in his cognitive activity.

Some explanations are here in order. Kant drew a distinct line between pure, or theoretical, and practical reason and tried to identify a sphere where pure reason is autonomous and show at the same time that it cannot go beyond that sphere because it deals with a phenomenon rather than a "thing in itself". Subsequently, the neo-Kantians and positivists who rejected the "thing in itself" made an absolute of the limited nature of the sphere of pure reason, or theoretical scientific thinking. In their conceptions, the subject of cognition is not man as such who has cognitive abilities, interests, aspirations and will, but an abstraction, a "pure" subject who does not exist outside the framework of the "purely" cognitive, or theoretical, relationship with

* In the context of today's big science, a large-scale activity, the scientist is on many occasions confined to a narrow sphere of professional functions. By research we mean a relatively limited integral act (or cycle) of cognitive activity in which the subject who plans and carries out the act may set the goal or task and chooses the means for solving it. Research in every case involves at least one such subject even when it lasts for years and large teams of scientists are engaged in it.

the object.[2] But, as Marx wrote, "people by no means start with 'staying in this theoretical relationship vis-à-vis *things of the external world'*... They start with ... not 'staying' in any relation but *with vigorous action*."[3]

Idealistic interpretations of cognition make an absolute of the fact that scientific activity which requires thorough special training and is regulated by specific standards and guidelines, presumes an application of human abilities, organized in a special way. Furthermore, the manner of reporting the results of cognitive activities in textbooks, monographs, articles in scientific journals, is characterized by their maximal depersonalization.* In this light the idea advanced by some cyberneticians that scientists can be replaced by computers capable of cognitive activities may seem not so absurd after all.

The view of scientific cognition as only of applying, in the words of Marx, "a natural force drilled in a particular way",[4] has little to offer for understanding the depth, multidimensionality, and dialectic contradiction of the cognitive activity. Unless we trace a logically streamlined sequence of embodied results of this activity, we cannot reconcile to an abstract "cognizing subject" without flesh or blood who performs only those partial functions which are needed to realize an equally abstract

* G. Gilbert and M. Mulkay, British sociologists, in their book *Opening Pandora's Box*, Cambridge, 1984, find significant differences between the description by scientists of their results in publications and in everyday informal communiction between themselves.

"cognitive relationship". Only with this view of scientific cognition, it can be treated in complete isolation from the values and the entire content of human life.

The treatment of science as a "functional subsystem" which interacts with other subsystems in a purely superficial way, inevitably leads to a view of scientific cognition as actions of the partial subject. But insofar as scientific cognition acts as a creative activity, it demands that all the essential man's abilities be applied; at the same time it is a tool, developed by human culture, for the extension and realization of these abilities. For this reason, any specific result of the cognitive activity does not boil down to impassionate recording of some hitherto unknown feature of the world; it is invariably a human achievement and property, a solution of a problem that man himself has stated and understood. Unlike a computer which solves programmer-formulated problems, the researcher can solve a problem, even stated by someone else, as long as he views it as his own, in other words, when he sets this goal for himself. But since the cognitive activity is a purposeful and goal-oriented activity, it inevitably becomes morally and ethically coloured. No matter how the purpose is understood, whether by appealing to the logic of scientific development or to the needs of society or the desires of the employer, the act of cognition is immersed into a value-rich rather than value-neutral atmosphere.

The human characteristics of scientific cognition are felt not only in that it is performed by man but

also in that it is performed *for man,* not in that science performs applied functions, mentioned in Chapter 1, but in that the knowledge acquired by the subject must be such that other subjects could also perceive and assimilate it. Thus, in Marx's words, "when I am active *scientifically,* etc. — an activity which I can seldom perform in direct community with others — then my activity is *social,* because I perform it as a *man*".[5]

Owing to the social nature of scientific activity, scientific knowledge is commensurate with man in that it must be essentially accessible for human perception and understanding. On the other hand, scientific knowledge is a substratum for human communication. As a rule, this is a specialized communication which requires special training, but still it is communication of humans.[6] In this sense the role played by scientific knowledge is dual: on the one hand, the developing and differentiating science gives rise to an increasing number of narrowly specializing scientific communities which have serious difficulties in communicating with one another; on the other hand, as scientific knowledge becomes a part of culture, not only professional or national, but of the entire mankind, science becomes a factor in making mutual understanding of people possible. The latter function is especially important because the scientific and technological revolution continuously enriches the treasury of knowledge which is vitally important for man in most diverse spheres, including everyday life, and comes his way through the educational system.

Consequently, the knowledge the subject obtains is such that it can be perceived by other subjects. It is not very important to what extent the subject himself is aware of this feature of knowledge, for he does not need to set this goal for himself, at least as long as he is engaged in research proper and not in presenting the results. This feature of scientific knowledge obviously owes its existence to the fact that the process of obtaining it is itself controlled by methodological standards which the subject need not devise anew but can acquire in the course of professional training. But this addressing of knowledge to other people, the fact that it is to invoke a response in other people, makes it possible to identify in cognizing activity aspects of social interaction and social activity. In effect, we have again approached the issue of the relationship between scientific knowledge and values, of its socio-ethical characteristics.

Science, notably today, acts not only as cognition by man and for man. It is increasingly turning *man into an object of research.* We will not take up all the causes of this phenomenon and its corollaries in the development of science and philosophy.[7] But it is in this sphere that the "headaches" of today's science are concentrated which could not be understood without socio-ethical analysis. It is in this sphere that the gap, dangerous for both science and man, between human cognition and human values is found.

Leaving out the various (occasionally conflicting) definitions of value and the history of this concept in bourgeois axiology, we will proceed

from a definition on which Marxists more or less agree, that this is a form in which the relationships between the subject and the object manifest themselves whereby the properties of the object are evaluated insofar as they satisfy the needs of the subject. These are the needs of a *social* subject and are generated by society; consequently, the evaluation of any material or ideal phenomenon is a *socially significant* one which enables man to orient freely (on the basis of the knowledge of laws) in the world around him and transform it through creative activity. But since human activity is purposeful, it has also axiological properties and brings to life what has yet to become consistent with the purpose. The evaluation of what is still in the making in terms of the set goal (the expediency relation) is the evidence of a unity of the scientific and value approaches because the purposeful approach is an efficient method of scientific cognition.

This was proved in a brilliant way by Marx who described the specific features of man's practical work in which the goal set in advance dictates the means to achieve it. "In creating a *world of objects* by his practical activity, in his *work upon* inorganic nature, man proves himself a conscious species-being... Man produces even when he is free from physical need and only truly produces in freedom therefrom... Man knows how to produce in accordance with the standard of every species, and knows how to apply everywhere the inherent standard to the object. Man therefore also forms objects in accordance with the laws of beauty."[8]

Marxism extends this approach to scientific activity. Accordingly, the Marxist axiology does not separate the values from scientific cognition, moreover, they are considered in inseparable unity and interaction with it. The basic principle of scientific cognition, the principle of objective truth, organically combines with the value approach both on the part of scientific cognition itself, which strives to achieve a certain goal (truth) through the means consistent with this goal, and on the part of society, which relates science as a whole, as a specific human tool for man's orientation in the world, with its own goals, viewing the latter as utility-practical and standard-setting or ideal criteria in evaluating scientific cognition.

By viewing scientific cognition and science as a whole from this angle we incorporate it, above all, into the sphere of epistemological analysis which determines to what extent knowledge reflects the truth. Lenin defined objective truth as a content of human ideas "that does not depend on a subject, that does not depend either on a human being or on humanity".[9] Still, "What is the truth?". This question arises here in the sense which has a bearing on the axiological relationship. Hegel spoke poetically of a "daring" search for truth, of the faith in the power of reason as a primary condition of scientific (for himself, philosophical) activities. "Man must respect himself and believe himself worthy of the most sublime... The concealed essence of the universe does not have a force in itself which could offer resistance to the daring of cognition; it should open up before him, demonstrate before his

eyes the riches and depth of its nature and let him take delight in them."[10] Cognition and values interact in an organic way because they are expressed through the creative essence of man as a doer and the very quest for truth, the very ability to cognize things are for Hegel the ultimate values.*

The value judgements on the logical structure of knowledge and on the axiological basis of the standards and relations inside the scientific community are inherent not only in the humanities, which simply could not exist without them, but also in natural sciences where they penetrate through the philosophical orientation and the methodological basis of these sciences. In this sense there is no value-free science. On the other hand, the very fact that cognitive activity is value-oriented does not deprive the content of knowledge of objectivity. This by no means implies that in every specific case the value approach performs only its constructive function, in particular in the case of the logical structure and the methodology of knowledge. It can also play a negative role in science and lead to various fallacious and anti-scientific teachings. In this connection Marx had this to say: "But when a man seeks to *accommodate* science to a viewpoint which is derived not from science itself (however erroneous it may be) but from *outside, from alien, external interests,* then I call him 'base'."[11]

* Fyodor Dostoyevsky gave a "loose" but profound definition, "the truth, especially in its purest state, is more poetical than anything in the world" (F.M. Dostoyevsky, *Complete Works* in 30 volumes, Vol. 21, Leningrad, 1980, p. 119, in Russian).

Marx thus evaluates a scientist's behaviour depending on whether in his cognitive activity he abides by the standards which act as certain values the most important of them being the *quest for truth,* which rejects *external* interests not because they are external but because they are *alien* to science, and for this reason external. This fact is especially important because the value orientation of scientific cognition (including its philosophical and ideological, and, consequently, partisan orientation) if motivated objectively, i.e. substantiated scientifically and therefore being the result of scientific cognition, is not alien to cognition or something which only distorts the truth.

It should be emphasized that interpreted in terms of objective truth may, to a certain extent, be the value judgements in science of philosophical and ideological nature, concerning the understanding of the overall goals and the corresponding means of scientific cognition, as well as those pertaining to the logical structure of knowledge and the axiological basis of its methodological standards. In this context, the scientistic argument that the true, objective knowledge is the opposite of the value approach which presumes ideological, humanistic and socio-ethical evaluations (Jacques Monod and others), and the post-positivistic conceptions of the "philosophy of science" (Thomas S. Kuhn, Paul F. Feyerabend, Stephen Toulmin and others) which regard the problem of objective truth in science as something well-nigh pointless while the understanding of the truth of scientific reasoning is made contingent on the nature of the ac-

cepted "paradigm"*, cannot but give rise to objection.

In rejecting relativistic approaches we rely on the dialectical-materialist understanding of the objective truth and the ratio of relative and absolute aspects in it. According to Lenin, this truth acts as a "measure or model ... to which our relative knowledge approximates".[12] Characteristically, he uses in this case the concepts of "measure" and "model" which also denote the methodological and normative (and in this sense axiological) nature of the objective truth. Moreover, Lenin emphasizes Hegel's argument that "truth is a process".[13]

Consequently, without obliterating the qualitative difference between cognition of truth and the value approach, certain characteristics of the objective truth in the dialectics of its relative and absolute aspects can be extended to the value approach. In this way, we come to the recognition of absolute, universal values, which exist as a kind of "measures" and "models", as well as relative truths. In considering value relations this approach may prove a reliable criterion for distinguishing between true science and pseudo- and anti-scientific teachings.

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* See, in particular, Thomas S. Kuhn, *The Structure of Scientific Revolution*, The University of Chicago Press, Chicago, 1970, pp. 176-207. He regards "paradigms" in their standardizing function (as "group commitments", "shared examples", etc.), or as values (pp. 181-188), but he essentially rejects the criterion of the objective truth of knowledge and of its consistency with the reality outside man and does not object to describing such views as relativistic (pp. 205-207).

Science is guided by numerous methodological standards; their observance is used as a criterion in the scientific community. In numerous cases, these standards are absolute, universal in that they make scientific activity possible. Such are the general principles and laws of cognitive activity, in particular in observation, experimentation and reasoning. Relativism, which obscures the criterion of the objective truth of knowledge, leads to subjectivism. On the other hand, the *developing* cognition introduces an element of relativity in truth itself as a process. Departures from the relativity principle lead to stagnation of thinking, dogmatism, and authoritarianism which replaces research by appealing to the opinion of an outstanding personality. These departures from the organic unity of cognition and values compose the core of pseudo-science and anti-science which inevitably violate the principle of the objective truth of knowledge and rely either on misunderstood values or on outright rejection of values. True, this rejection is never openly declared; for this reason, the falsity of value judgements cannot be ascertained unless by objectively relating them to the final result of the process they guide.

This has repeatedly happened in the history of science. In particular, misinterpreted philosophical guidelines, which were seemingly consistent with the dialectical materialist world view and methodological principles, were used in pseudo- and anti-scientific attempts to reject the theory of relativity and cybernetics. As for genetics, an attempt was made to create a "materialistic dialectic" theory of heredity and variability of organisms,

which would oppose the "idealistic metaphysical" one. Not only was the boundary between truth and falsehood in science obscured; they occasionally exchanged positions and philosophical value orientations were also distorted and acted as aprioristic and dogmatic ones, leading directly to anti-dialectic conclusions.

Distortion of value relations in a scientific discipline is thus seen to lead to a general deformation of values themselves and of the value of science as such, the value which is not only related to the social status of science but is dictated by its internal structure. The value of science manifests itself in the general context of human activity in which science is a means of achieving socially significant goals and in which science is evaluated in essential terms in its relation to society and the personality. This context determines also a more specific understanding of the significance and the guiding role played by socio-ethical and humanistic principles of scientific cognition. Let us turn to this issue in the context of today's science.

To begin with, we have thus far discussed science as a whole without the usual classification into fundamental and applied disciplines. For our purposes, the difference is such that for the former the ultimate value is truth whereas for the latter truth is merely a means of attaining a certain specific goal. In other words, in basic research truth is a self-sufficient value while in applied research it is an instrumental value. The essential difference is associated with the degree of their internal social autonomy, which leads some people to assume the

existence of two qualitatively different systems of value relations, i.e. of such as social criteria, conceptual orientations, and ethical or humanitarian principles.

In this light, the origins of scientistic and technicistic pragmatic views may be attributed to the development of applied sciences. This explanation would, however, amount to evasion of an analysis of the problem. In point of fact, it does not arise as an acute problem of today unless we cease to attach an absolute value to the difference between fundamental and applied sciences in their relation to truth and value and consider them as an integral whole (certainly, not denying differences between them).

Indeed, science as a whole and as a specific social institution, defines its value as a means for humanity to arrive at practical goals; this applies to both basic and applied research in full compliance with the premise that there is nothing more practical than a good theory. Science as a whole (not fundamental science alone) can perform this basic social function only if the search for truth is its goal and if it proceeds from the objectivity of knowledge as the ultimate value rather than is guided by a certain "optimum" of what is feasible under actual conditions (which may seem to be the purpose of applied, including political, sciences). Of course, in fundamental and applied sciences these accents are placed in different ways but of greatest importance are the common goals which unite them and which characterize science as the search for truth and a compass of human activity.

All this acquires especial significance when we take up the socio-ethical and humanitarian principles of scientific cognition which have a major regulatory role to play today. *Science for man* is the sole common socio-ethical humanistic guideline providing a universal yardstick for evaluating science in terms of its ability to serve man and the compatibility of its goals with the general goal of social progress, which is to create conditions for the realization of essential human abilities becoming a goal in itself. It is noteworthy that Marx said about society: "i.e. man himself in his social relations".[14]

The question arises not only of the *value* of truth but of its *price*, the reference point being man and his well-being. Although man's well-being has never been strictly defined and remained relative to the specific historical (including social and class) conditions, it has always acted as a universal value. It is treated like this today in discussions of the paths and goals of social progress. The 27th Congress of the CPSU stated: "The Communists have always been aware of the intrinsic complexity and contradictoriness of the paths of social progress. But at the centre of these processes—and this is the chief distinction of the communist world outlook—there unfailingly stands man, his interests and cares. Human life, the possibilities for its comprehensive development, as Lenin stressed, is of the greatest value."[15] Therefore, in this issue no kind of relativism is admissible for it would undermine the very basis of humanistic ethics. There is no question of choosing between the ethical (humanistic) and the

relatively ethical (purposeful, expedient) which must in every case be seen as at least a partial break with the original principles of ethics and humanism.

This reasoning has a direct bearing on the relationships of today's science with man and society. As probably never before, the question of price is acute, the price which humanity must (or must not) pay for truths to be discovered in nuclear physics, molecular biology and other fields of basic research. It is fairly easy to shift the entire burden of moral responsibility on applied sciences (and technology) and still easier to put it squarely on society whose needs the scientists are assumed to meet being guided by the principle of the necessity, expediency, "optimality" (efficiency) under the existing conditions. None can, however, evade the problem of ethical choice, and evaluation of decisions which are even minutely inconsistent with the ethical, humanistic standards as violation of these standards (and as evil, albeit probably inevitable evil) – this evaluation makes it possible to hold negative processes in check, to some extent, and to counter them, having a clear prospect in mind.

This position is different not only from ethical relativism and nihilism (scientism) but also from the "critique of science" which expresses Rousseauistic views and proposes slowing down the scientific progress (e.g. the concepts of "counterculture", "zero growth"). For us it is clear that only more profound, comprehensive, harmonious development of science and technology for the benefit of mankind can eliminate the negative

consequences of science and its applications. However, this is only possible under social conditions in which the well-being of man is the overriding goal.

These issues are discussed in contemporary science, notably in philosophy, chiefly in connection with the admissibility of certain kinds of research which by themselves or in applications may damage man and humanity. Not only nuclear physics is the subject of controversy but also molecular biology, genetics, medicine, psychology and other fields of knowledge where man is the object of study.

A spectrum of socio-ethical problems, some of which will be discussed in one of the subsequent chapters, are generated by experiments with recombinant DNA molecules and genetic engineering. It is not accidental that many scientists believe man will come across political, moral, ethical and psychological problems which will make those facing nuclear physicists look like child's play.

In particular, Bentley Glass, a US biologist, noted that the development of biology poses fundamentally new and very complex problems for philosophy. "I think that the gravest ethical problems of our present day arise from the advances which are being made in science at the present time, not in the nuclear sciences only, but especially in the biological sciences... I insist that philosophers of science would do well to think a great deal more in the future about ethical problems than about logical problems."[16] He implied the total danger for man and humanity of using the

biological findings in warfare, the consequences of using psychopharmacological drugs, the practice of organ transplants which poses, among other things, the complex question of "what makes the individual".

For these reasons, the development of more stringent socio-ethical standards of experimenting with man and, most importantly, more stringent social and ethical *supervision* of observance, becomes increasingly vital needs. The uniqueness and freedom of the individual should be unambiguously recognized and backed by moral and legal acts and activities on the part of the entire society, and free development of experimentation with the observance of appropriate standards. True, in this sense any experimentation with man implies intrusion into the inalienable human rights and freedoms but it can be restricted to an extent which makes it consistent with the system of moral and other values of society and resultant from freely-made decisions.

The general socio-ethical principles are largely dictated by the kind of society which adopts and implements them and by the understanding of man and the fundamentals of humanism. But today, despite the existing differences in interpretation of these problems, numerous scientists believe that a generally acceptable system of international agreements is necessary to regulate biological (genetic, medical) study of man. A strict ethical evaluation of the theory and practice of cognition is essential as is supervision backed by national and international legislation.

In this context, the admissibility of experimental manipulations with man has been widely discussed.* The criteria of admissibility (or inadmissibility) are defined in accordance with the primary ethical and humanistic principles. Thus some French researchers identify three influential ideological schools of thought in Western countries concerning ethical aspects of human experimentation. The first opposes any interference in "the natural course of things" which is viewed as God's will. Its adherents denounce innovations, especially in relation to the inception of human life. The second believes that "freedom of personal choice and tolerance" is the basic value and advocates supremacy of the individual over the society. On the ethics of biomedical experimentation, its adherents support the individual freedom of the patients; any experiment is acceptable and even desirable ethically, provided that it meets the needs of and is freely accepted by the object of the experiment and the experimenters. This view is willingly joined by those who emphasize the utmost value of scientific cognition. The third school of thought supported by numerous Roman Catholics (and not only by them) proceeds from the social nature of human existence. Its proponents believe that the freedom of individual choice must be con-

* Numerous ethical problems arising with progress of modern biology will be discussed below. The ethical aspects of these problems are quite specific because they bear upon medicine and the physician as well as biology and the researcher, and because in this case man acts as both the subject and the direct object of cognition and practical action.

strained in order to avoid serious dangers for society and damage to human dignity.

On the whole, most scientists and ethicians agree that the primary ethical and humanistic principles must be observed from the very beginning of the preparation for the experiment and must not be ignored in anticipation of significant discoveries. In other words, as anywhere else, the ends do not justify the means in a biological experiment with man.

The legislation of numerous countries, including the USSR, allows clinical experiments with man. Moreover, it should be defined in unambiguous terms when and how often, to what extent, and at what risk such experimentation is permissible. No scientistic manipulation of man incompatible with the ethical principles of humanism and sovereignty of the personality, should be permitted. The exact definition obviously should not be formulated by the scientific community alone.

Barbara J. Culliton, a US journalist, notes that in her country the interest in this problem grew rapidly in 1967 when Christian Barnard, a South African surgeon, performed the first heart transplant. This operation gave rise to numerous sharp discussions on the ethical aspects of biomedical research. Approximately at the same time, the US media reported numerous examples of cruel human experiments with crude violation of ethical standards: "There was the Willowbrook scandal involving the exposure of young institutionalized children to hepatitis virus. There was the case of the cancer researcher who injected cancer cells into elderly patients dying of the disease. There was the Tuskegee syphilis experiment in which affected men were left untreated as controls even after penicillin became available. And there were startling, if somewhat overdramatized, reports of scientists perfusing the decapitated heads of fetuses in studies of blood

flow. These were isolated incidents, to be sure, not representative of the vast majority of human experimentation. But they certainly seemed to be outrageous."[17]

For this reason voices are becoming loud and insistent calling for developing global criteria for human experimentation, which could be summarized in national and international codes.

"The first such code was the Nuremberg Code, which was formulated in a 1947 court opinion at the trial of twenty-three German physicians for 'war crimes and crimes against humanity'."[18] The court rejected the arguments of the defence which advocated the ethical legality of the experiments the accused made on people. The court noted that the ethical principles were observed only in certain types of medical experimentation with human beings when these experiments were carried out in reasonable and stringently defined bounds. The court then described those bounds in terms of ten "moral, ethical, and legal" rules now known as the Nuremberg code.

The Nuremberg code recognized two types of clinical research: therapeutic and non-therapeutic. In the former case research goals are combined with the treatment of the patients; such research is allowed to the extent of its therapeutic significance. In the latter case, the main objective is pure research which has no therapeutic value for its objects.

The Nuremberg code defines the boundaries of ethically admissible activities in clinical research. The informed consent of the patient is of key importance in assuring the ethical acceptability of the research purpose, sequence and procedure. The patient's consent must be competent, voluntary, informed and based on understanding. The researcher must provide all the necessary information for the patient and an estimate of the extent to which all other conditions will be observed. As stated in the code, "it is a personal duty and responsibility which may not be delegated to another with impunity". The disclosure of information for the patient is couched in the fol-

lowing terms: "Before the acceptance of an affirmative decision by the experimental subject there should be made known to him the nature, duration, and purpose of the experiment; the method and means by which it is to be conducted; all inconveniences and hazards reasonably to be expected; and the effects upon his health or person which may possibly come from his participation in the experiment." In discussing the plan and procedure of the experiment, the evaluation of the expected hazard has to be related to the subject's well-being. The code bans experiments which can be reasonably expected to cause death or irreparable damage to the subject. An exception is made for the experiments that physicians conduct on themselves. The expected hazards should never exceed what is defined by the humanitarian importance of the problem and the experiment should be conducted so as to avoid any unnecessary physical or psychological suffering or trauma.

The principles of the Nuremberg code now underlie all moral and legal decisions on human experimentation. The evolution of medicine and biology and the experimental practice continuously make the physicians and scientists face new problems, and revise and update the earlier advice and guidelines. This was done in the International Code of Medical Ethics of 1949 and the Helsinki Declaration of the World Medical Association adopted in 1964 and revised in 1975 at the WMA assembly in Tokyo. These documents contain more specific advice on clinical research, global ethical principles of experimentation on living human subjects, and the objective and subjective criteria of ethical admissibility or otherwise of experiments with people. The addenda to the Helsinki Declaration that were adopted by the colloquium on "Experiments with Man" held in Switzerland and Ar-

ticles 6 and 7 of the International Covenant on Civil and Political Rights adopted by the UN in 1966 and other UN documents are very important.

The 1964 Helsinki Declaration reduced somewhat, in comparison with the Nuremberg code, the requirements concerning the informed consent in therapeutic research by entrusting the physicians with the decision on the amount of information to be given to the experimental subjects. This gave rise to justified criticism and so in revising the Declaration in 1975, a decision was made that if the physician believes it important not to obtain informed consent, the grounds for this should be recorded and transferred to an independent authority. At the same time, since psychopharmacology and behaviour modification techniques have been sophisticated in recent times, the Declaration calls on the physician to be especially careful in clinical research in which drugs or experimental procedures may change the subject's personality. One important addition to the 1975 Declaration was the demand that reports on experiments which deflected from its principles should not be published.

The Helsinki Declaration formulated for the first time the idea of setting up an independent committee which would certify the consistency of the plan and the conduct of an experiment with ethical standards. This made possible ethical supervision of biomedical research. From our point of view, the requirements for the ethical justification of a future experiment and the corresponding evaluation of articles submitted for publication, have a broader

sense which goes beyond the framework of biomedical research and is relevant for all fields of scientific knowledge in which socio-ethical issues are acute.

Two articles of the Helsinki Declaration emphasize the priority of the subject's health and welfare over the interests of science and society. The preamble notes that its advice will be updated as biology and medicine develop.

Significant contribution to supervision of the observance of the ethical principles in experiments with man is made by international organizations, such as the World Health Organization (WHO), the World Medical Association (WMA), and the Council for International Organizations of Medical Sciences (CIOMS), which have worked out a number of documents on medical ethics. The CIOMS- and WHO-sponsored conference on Protection of Human Rights in the Light of Scientific and Technological Progress in Biology and Medicine, held in Geneva in 1973, was a significant event. It drew attention to the need to introduce constraints and bans, in particular in genetics and psychosurgery, in order to protect human rights and dignity, and freedom of the individual. A document on the limits and forms of human experimentation was adopted.

All such documents are, as a rule, an outcome of sharp discussions involving physicians, biologists, experts in ethics, lawyers, and public figures. Therefore, advice on human experimentation may be viewed as a major "applied" result of research in the ethics of science.

The content and general line of such discussions are illustrated in a book *Experiments with Man*.[19] It shows the need to identify different types of experiment; in medical practice and in biomedical research these types tend to alternate and each gives rise to its own ethical problems.

Four basic types have been defined:

Type 1. Every human being is physiologically and psychologically unique. For this reason, even therapeutic treatment is to a certain degree a hazardous experiment. There are so many variables that the outcome is always uncertain. In this sense, medicine has always been an experimental science developing essentially from one working hypothesis to another, from one deduction to another, made following observation of largely uncontrollable and random clinical events that were thoroughly studied and verified.

Type 2. As the methods of experimental science found their way into medicine, it became necessary to systematically gather verifiable and quantifiable data. The physicians began to act as scientists and the patients, as experimental subjects. Recovery remains the main objective, but in the course of treatment, data is collected for checking and updating theories, therapeutic methods and drugs and for devising new theories.

Type 3. For basic clinical research a new pattern of experimentation has been developed. The basic goal is not immediate therapeutic advantages but improved knowledge of physiological, biological, and psychological functions in general, independently of possible direct therapeutic results.

Type 4. As human biology scores new successes and these are applied to social problems and as physicians become participants in this process, the complexity of ethical issues grows. A new, thinkable and feasible line of biomedical research is manipulation of the genetic material by using the knowledge of molecular biology, in particular the chemistry of genes. Although this may occur only in the distant future, such knowledge may be used to repair genetic faults or to introduce genetic changes in the interests of society according to models planned in advance. Neurosurgical, and in the future also neuropharmacological, changes of the personality are thinkable and feasible. The ethical principles guiding this research are signifi-

cantly different from those of the other three types. In this case, the society and the researcher must act as guarantors of preserving new generations and therefore the admissible boundaries have to be imposed on manipulation of the basic genetic material of man as a biological species.*

In this context, the authors of *Experiments with Man* perform a challenging, although philosophically highly questionable, critical analysis of the premises for biomedical research. They believe that since medical practice is partially based on the natural sciences, it should rely on the general assumptions of the scientific method and technological applications of science: (a) cognizability of matter by observation and experiment; (b) possibility of its quantitative description in terms of logic and mathematics; (c) possibility of achieving these goals experimentally; and (d) applicability of scientific knowledge to technology for the benefit of man. At the same time, the authors believe that for medical practice and, even more so, for medical ethics, the following fundamental assumptions are important: man is a unique phenomenon in the Universe, a being capable of thinking and social relations; he is capable of free choice by agreeing or refusing to become an experimental subject; he is capable of moral judgements of himself and of taking responsibility for his actions; being what he is, man, when he becomes an object of scientific research and experimentation, requires a special approach and imposes on a researcher or a physician some constraints which, by their nature, go beyond the framework of science.

The formulation of these assumptions does not signify their endorsement in this form. Their critical review in the light of scientific experience calls for certain amendments. In particular, one has to admit that in experimentation with people such scientific knowledge is admissible and useful that is chiefly descriptive and unquantifiable. Consequently, assumptions (b)

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* Many scientists believe that if even as much as one per cent of undesirable, pathological genes are replaced in all people by normal ones, the combination of the remainder 99 per cent (50,000) may provide practically the same infinite variety of individual hereditary programmes that is now available.

and (c) have to be revised and extended. What is more, the faith in technology implied in the simplified formulation of item (d) has to be specified with a view to the fact that technology requires economic, social, and, certainly, moral resources which are not necessarily available and that any important technological decisions, including such that are made with good intentions, may give rise to new, more complicated problems; therefore such decisions may serve both good and evil purposes.

As they note the ambivalence of the existing situation, the authors of the above-mentioned book feel that ethical standards are essential for biomedical research and practice and the existing conflicts and dilemmas have to be heeded.

Above all, there is a gap between actual scientific progress and public expectations. For a long time, science has been confined to "pure research" which has not been applied. What is more, when the practical results are already tangible, the hypothesis needs thorough checking in carefully arranged, monitorable and sensible experiments. However, the public (the entire population or governments, research-funding agencies, the drug industry or journalists) crave for important scientific discoveries and technological breakthroughs which would quickly and efficiently tackle the unresolved issues or cure diseases and ailments. The authors formulate the problem as follows: the pressure of the impatient public is to be withstood, a pressure which may compel the researchers either to shut themselves in an "ivory tower" or embrace "bad science" which jumps from unproved or insufficiently proved assumptions to the statement of facts.

This dilemma becomes acute and very personal in the relations between the scientist-doctor and the patient. When should a conventional drug or therapeutic method be applied (or discontinued) if they have never been thoroughly tested? When is a new drug or method admissible that has not been completely tested if the gap between the advanced biomedical research and conventional medical practice is not to be too wide? To what extent should the patient be informed of the dual nature of the drug or method and the ensuing uncertainty?

New discoveries give rise to new problems in biomedical research:

– the fast growth of population and, as a consequence, overpopulation largely attributable to the successes scored by medicine in countering high infant mortality; the problem of the aged who are incapable of full life and whose vital functions are sustained exclusively by strong drugs and thus, rather than the problem of euthanasia (which is usually understood as putting to death by a lethal dose of a drug), there emerges the problem of orthonasia (use of sedatives which let the patient die calmly without resorting to drugs which would artificially sustain the vital functions);

– unforeseen long-term detrimental consequences of the wide use of strong insecticides;

– interference in the process of the survival of the fittest, a characteristic feature of natural selection, as a manifestation of love for the weak which might result in deterioration of the human genetic material and thus endanger the future of mankind (some prominent scientists, however, reject the view that the human genetic material has been deteriorating over a long period of time).

These and other problems in biomedical research lead to the question: What should we do about the available and "arriving" dangerous knowledge? What choice will humanity make: will it go along a path offering short-term positive results or pursue an unchartered road along which the patient or the society may in the long run face harmful consequences? Biomedical research is intended to benefit mankind but it frequently brings about evil. Can this be regarded as its inherent property? Should this research continue as a chain reaction of new discoveries or are there some limits to such research and its independence?

Ambiguity and conflict are present in the very situation of a biomedical researcher. His work may be motivated by curiosity and quest for truth, the desire to improve the human lot, to win recognition (e.g. a Nobel Prize) or other, less exalted stimuli. What is also true is that on numerous occasions he works under extreme tension which can be traced to the expectations of the public or the financing bodies, the circumstances connected with the routine of appointment to official positions in research laboratories and universities, the

need to publish one's work, etc. The researcher also knows full well that whatever his good intentions, the application of his findings is beyond his control. His results may be used against his will in bacteriological warfare or in irresponsible manipulation of genes. However, researchers have little if any opportunity to discuss with their colleagues in the laboratory or department their motivations or moral dilemmas or the possible long-term consequences of their research. The discussion of such problems must not become the privilege of concerned scientists alone. How can such discussions be stimulated in undergraduate courses and the relevant problems made an integral part of biomedical research?

In effect, the authors of *Experiments with Man* have explicitly posed numerous important questions to which the scientists, whatever their conceptual, philosophical and social positions, must obviously give unambiguous answers. This goal is not, however, served by the sensational manner in which numerous medical and biological discoveries have been presented to the public in the West in recent time. What an abundance of conjectures followed the reports on the transplant of a human ovule fecundated in an artificial medium, or a successful birth of a first "test-tube baby". Still, the real and occasionally very complex problems which arise in scientific experimentation cannot be ignored. They require, according to many scientists, an essentially new way of thinking, new ethical and legal rulings which would draw a distinct line between admissible and inadmissible interference into ethical, family and intimate relations. These problems become increasingly acute as the manipulative approaches to experimentation with man become increasingly likely. Legal, as well as

ethical, regulators will have an important role to play.

International Guidelines for Biomedical Research Involving Human Subjects was adopted at the 15th Round Table Conference of the Council for International Organizations of Medical Sciences (Manila, 1981) and endorsed by the WHO Advisory Committee on Medical Research, meeting in Geneva, for distribution to ministries of health, medical schools and faculties as well as other interested bodies. In his article "Human Experimentation and Medical Ethics"[20] Frank Gutteridge noted that the fundamental ethical guide-lines in biomedical research involving human subjects had been formulated in the World Medical Association Declaration adopted in Helsinki and revised in 1975. However, the practical application of these guidelines proved difficult. The expansion of medical research, especially in developing countries, made it necessary to study possible applications of the Helsinki principles with a view to the existing legal provisions and administrative regulations so as to protect human rights and social welfare.

The basic points in ethical control of biomedical research on human subjects are conscious consent of the subject and analysis of the proposed research (including the procedure of obtaining the consent) by a competent and independent body. Four main questions have been revealed which have not thus far been fully answered. These are: the concept and validity of informed consent; the ethical issues in community-based research; the ethical review procedure for biomedical research involving human

subjects; and the protection of subjects involved in research.

As recommended by the National Advisory Committee on Ethics in Sciences of Human Life and Health, set up in France in 1984, experiments with man are regarded admissible if the prior data are sufficient; the scientific value of the project is high (research undertaken with advance scientific knowledge is unethical); an acceptable balance of hazards and benefits is achieved; the patient's consent is voluntary and unambiguous; and the project is assessed by an independent panel.

International guidelines couched in terms of general comments supplemented with specific advice add up to an attempt to answer these and other questions on research involving human subjects, including compensation for harm done in the research. In particular, as regards informed consent, clarifications are provided for the cases of legal incompetence (physical and mental deficiency, minority) of persons involved in the experiment. In such cases, a guardian or a committee independent of the researchers should be available. The latter is also required in community-based research.

Starting with the Nuremberg code, the principle of informed consent is viewed as a most important socio-ethical principle of experimenting with humans. In real life, however, its implementation runs into difficulties. The researcher is obliged to see to it that the subject consents to an experiment being fully aware of its essence and possible consequences. The scientist must be sure that the con-

sent is conscious and given with full understanding of the experiment and the hazards involved. Obtaining a consent from an uninformed or insufficiently informed person is treated as deception and fraud.

Perry London, a US psychologist, describes a case in 1963 when "some cancer researchers in Brooklyn, New York, injected live cancer cells into some old people to see if they would 'take'".[21] "'We did not want to worry them', was the explanation later offered to a Congressional investigating committee ... as one of them put it, he thought he was 'too valuable' to the project. The old people were told they were getting injections of some 'cell suspensions', and they consented to them, probably thinking they were getting some kind of medicine."

In this case, the action of researchers is unpardonable. But the situation is not necessarily so clear. Withholding some of the information or deception may be the chief condition of the experiment. Thus, in testing new drugs affecting the psychic state, the chemical action should be separated from the psychological effect in subjects who know what to expect. In this case, the control group is given innocuous substance disguised as drugs. Deception is necessary here as experiments with informed consent would have no value. On the other hand, the higher the risk in taking a new drug the greater the responsibility of the researcher and the more binding his duty to inform the subjects.

London also reports a series of experiments conducted at Yale University, USA, by Stanley Milgram whereby the subjects had to be deceived about the purpose of the experiment and the part to be played by them. They were told that by means of electric current they induced suffering on other people, whom they did not see. Three-quarters of the subjects carried out the orders of the experimenter although they believed that they made other people suffer. The critics of this experiment noted that psychological harm was done to the subjects. In such cases, the experimenters provide post factum explanation of the research but this does not remedy the psychological harm and many experts believe that deception of the subjects is impermissible.

The procedure of analyzing the ethical aspects of community-based research, the CIOMS and WHO noted, presumes the setting up of panels on ethics or councils under institutions, in which independent colleagues of the researcher would be represented. As for protecting the health of people involved in research, the requirements must be especially stringent as far as children, pregnant women and nursing mothers, psychotic patients and mentally retarded persons and people from population groups who are not familiar with today's clinical conceptions are concerned and in the case of any non-therapeutic interferences. Children must not be involved in projects in which adults would equally do. Children are necessary only in studies of children's diseases or of conditions which affect mostly children. In a similar manner, psychotic patients and mentally retarded persons must not be subjected to research which could be conducted with an equal degree of success on psychologically normal persons unless the causes and treatment of psychotic diseases or associated disabilities are studied. Pregnant or nursing women must never become objects of non-therapeutic research which is not concerned with pregnancy or breast feeding. Therapeutic research is inadmissible unless its purpose is to improve the health of the mother without harming the foetus or the infant or is designed to improve the vitality of the foetus or facilitate the development of a healthy child or to improve the mother's ability to nurse the baby.

Consequently, the range of socio-ethical and humanitarian issues in today's science does not remain

in the sphere of abstract moralizing; their resolution is a vital concern of entire humanity. Today's science boldly tackles the problems of medical ethics.[22] In the Soviet Union they have been seriously discussed and practical decisions have been taken, in particular, by the USSR Academy of Medical Sciences.[23]

These problems are, as noted above, widely discussed in the West. Although the sensational presentation of these discussions may be questioned, it is noteworthy that, for instance in the USA, biomedical research not only develops by itself but much effort is invested in a wide range of issues termed, following the publication of Van R. Potter's book, as bioethical.[24] Hundreds of thousands dollars are allocated for this research; numerous experts around the world contribute to various international organizations dealing with the ethical aspects of biomedical research. In publications on the philosophy of science an increasing amount of attention is given to the ethical problems in biomedicine.

Michel Lacroix, a French scholar, notes a significant role in the making of bioethics played by an article by H.K. Beecher[25] and a book by M.H. Pappworth.[26] According to Lacroix, the subject who agrees to be involved in a biomedical experiment, thus gives consent to being a passive object and abdicates for a certain time his thought and will. "Metaphysically, an experiment is a dramatic event. Admittedly, it suspends the essence of man."[27]

He reasons further that bioethics takes interest in the situation in which the very concept of the

personality becomes obscure. This is the case where one is a donor of his organ for a transplant and thus sacrifices the integrity of his body. This is also the case of experiments with human foetuses which are beings whose personal human quality is dubious. Such problems also arise in discussions of euthanasia in which biological survival is dictated by the quality of full human existence and in invading the genetics or behaviour modification when it is not clear to what extent man preserves his personality in undergoing profound changes. The unity of bioethics as a field of knowledge "comes to it not from its object, the life, but from the epistemological nature of a marginal situation which occurs in every problem which it faces".[28]

The Seventh International Congress of Logic, Methodology, and Philosophy of Science, held in Salzburg, Austria, in 1983, had a section dealing with specific issues in clinical experimentation, in particular with children, as well as the basic guidelines of the ethics of science.

As R.M. Hare of Britain noted in his paper, these problems owe their origin to the fact that research in childhood diseases cannot develop without experiments. However, these include physical and other interferences, which is believed to infringe on the children's rights. He advocated a combination of the utility and deontological (ethical) approaches to such experiments.

Some researchers, Hare notes, view this issue through the prism of possible risk versus benefits implying that an experiment is justifiable if the expected benefits outweigh the expected harm. This approach usually evokes resentment of utilitarianism, which may be assuaged, according to him, if one takes into account the fact that utilitarianism is impartial towards various individuals. But then another objection arises:

the doctor's duty concerns his patient rather than other people. The doctor must be partial in relation to his patients. The other objections have to do with the rights of patients and research subjects: they should not be exposed to physical interference without their consent (which children are believed to be incompetent to give); personal information should not be used for research purposes; the patient must not be deprived of potentially helpful therapy (as happens with patients in control groups).

All these objections boil down to the assertion that utilitarianism is in conflict with common moral attitudes and thus must be rejected. It is believed that a struggle is going on between utilitarianists, followers of Bentham and Mill, who tend to judge by results, and intuitionists, followers of Kant, who base themselves upon the concept of duty, proceeding from deontological principles. Hare notes, however, that in this context a historical and philosophical fallacy may appear. Can these two approaches be reconciled? Is either of them true for a certain stage of moral justification? If so, once we distinguish these stages the conflict will be resolved.

A more sophisticated approach, according to Hare, divides the moral reasoning into two levels, the intuitive and the critical ones. At the intuitive level, where most moral decisions are made in everyday life, we often act as the deontologists would advise.

We abide by a number of independent moral principles, each being very important, sacred and inviolable at this level of reasoning. They include: the first responsibility of the doctor is his patient; non-interference without informed consent (at least as far as adults are concerned); confidentiality. The fact that in some cases these rules may prove conflicting calls, according to Hare, for a higher level of reasoning if these conflicts are to be resolved. This is also essential because there is no justification for abiding by these rather than other intuitive principles. According to utilitarianists, this higher level is a utilitarian one. At the same time they also agree that a lower, intuitive, level exists. In this way, the conflict between the two schools of thought is resolved.

Hare argues that we must choose our intuitive principles for utility reasons but then unswervingly adhere to them be-

cause this is the most reliable way to the greatest utility. If the principles have been chosen correctly, the utility is maximal. In medical practice and research reliable general principles recorded in medical codes and backed by appropriate supervision, are obviously useful. Some of them should be legally enforced.

The first and foremost principle of this kind is, apparently, a ban on physical interference without the subject's consent. The intuitionists feel that this principle is self-evident; the utilitarianists believe that it is necessary because its violation may do much harm. In the case of adults, this principle is consistent with another one, according to which everything possible must be done for the development of medical knowledge,for the benefit of all because there are adults in sufficient numbers who would agree to be subjected to research either in a therapeutic investigation when a new treatment method is tested, which can do good to a subject, or in a non-therapeutic research which may improve medical knowledge rather than be useful to a specific patient.

The case of children presents a special problem because they cannot give an intelligent consent either through their inability to grasp the information which is a sine qua non of informed consent (for a person must know what he agrees to), or through their inability to make a reasonable decision in their own interest relying on the available information. Therefore, some writers insist that non-therapeutic experiments should never be conducted with children. Most codes, however, allow experiments of minimal hazard with the consent of parents or guardians. This "consent by proxy" is justified by the assumption that, as a rule, parents are strong protectors of their children's interests. But in some cases the interests of children and parents may be in conflict (when the researcher subjects his own children to experiment or if the parents are paid for the participation of their children in the experiment or induced in some other way to consent to this). Therefore an argument is advanced sometimes that consent must be obtained from independent persons who act as guardians in such cases. In some cases, the decision must be made in court. Others believe that the guarantors must be "ethical" panels independent of the researchers and including both medical and non-medical members. The advantages of each

of these mechanisms must be judged, Hare believes, by the degree of success in, above all, protection of human rights, specifically, the rights of children, while not preventing important research.

Hare's paper has thus covered numerous controversial problems in biomedical ethics although his own philosophical interpretation is not immune to criticism.

Speaking at the Seventh International Congress of Logic, Methodology, and Philosophy of Science, K.E. Tranøy of Norway, who was in general agreement with R.M. Hare's argument, identified two main areas of medical ethics: that of clinical medical practice and that of biomedical research. Today's clinical medicine may be described, he believes, as practice relying on scientific theory. The ethics of biomedical research presume the ethics of clinical medical practice which are based upon common morals.

Tranøy agreed with Hare that distinguishing between deontological (intuitionist) and utilitarianist moral argumentation is very important in medical ethics, notably as far as experiments with children are concerned: deontology treats standards, rules, rights, and duties; the utilitarianists who evaluate actions by their consequences deal with values, good and evil. In his view, however, this difference, to which academic moral philosophers attach such importance, is not very important for those who have to deal with biomedical ethics in their own practice. There can hardly be medical ethics which would not need both basic standards and rules and a systematic evaluation of the consequences. Tranøy noted a very important development in biomedical ethics over the recent decades: until not very long ago, these issues were discussed by doctors alone but now the discussions also involve lawyers, theologians, philosophers, sociologists, psychologists and the general public.

In concluding the discussion of ethical issues in medicine and biomedical research, a few remarks are in order. Medical ethics is known to be the most ancient system of professional ethics first formu-

lated by Hippocrates whose oath states the moral code of the physician's duties and obligations in respect to his colleagues and patients. These standards made the interests and welfare of the patient the highest priority and called on the physician to do his utmost to preserve the life, alleviate the sufferings and restore the health of the patient. They continued to act as moral control in more recent times. History knows numerous instances of self-sacrificing performance of medical duty. The Hippocratic code is still relevant today. Its standards constitute the reference points in the development of the moral code of physicians' behaviour.

Medical ethics has to be developed, we believe, for the following reasons.

First, medical professionals possess special knowledge and skills, which non-professionals do not have; they have also to choose the best way to apply their knowledge and skills in specific cases.

Second, medical professionals work in continuous direct contact with non-professionals who, as a rule, cannot efficiently supervise the quality and integrity of the professionals' work, the soundness of their actions. The standards of medical ethics, although recognized and recorded primarily in professional consciousness, are worked out by society as a whole which protects the interests of each of its members in their interrelationships with medical professionals. The observance of these standards, in particular, guarantees the social status of the profession. Thus, the professional community of physicians, as a rule, morally sanctions its members who transgress the stand-

ards of medical ethics. There is also a kind of asymmetry in the doctor-patient relationships, for the former offers his knowledge and skills and the latter, his most valuable possession, his health and life. This is also a moral-ethical asymmetry in that the patient has chiefly rights while the physician, chiefly duties, and the latter should not only respect the patient's rights but also keep him fully informed of them.

Medical ethics presumes close contacts and co-operation, based on mutual confidence, between the physician and the patient. It is not only the psychotherapeutic effect of the atmosphere of mutual trust that is important: the physician is *obliged* to ensure this contact and the patient is *entitled* to a human and kind attention on the part of the physician. An essential condition of this contact is the patient being regarded as an integral unique person. This is expressed in a maxim, or ethical principle, "Cure the patient, not the ailment". The rapidly developing specialization in medicine and the increasing reliance on medical equipment make the direct physician-patient contact difficult; as a result, new moral and ethical problems arise. Even so, respect for the patient as a person remains the cornerstone of medical ethics.

Frank and credible information by the doctor of the patient or his proxy (in the case of children or mentally deficient persons) greatly contributes to an atmosphere of confidence. As long as the patient asks him, the doctor must provide exhaustive information on the nature and possible consequences of the ailment, the advantages and disadvant-

ages of the available ways of treatment. Whether the patient asks him or not, the doctor must inform him of the possible negative consequences of the treatment. If the proposed treatment may do irreparable harm or endangers the patient's life, the doctor must not only inform the patient but obtain his voluntary consent. A major ethical problem is whether the patient should be informed of the diagnosis in the case of a disease which is difficult or impossible to cure because full information may make the patient feel doomed and depress him in resisting the disease. In such cases, the doctor must be especially tactful and considerate of the specific personal qualities of the patient. Some authorities in medical ethics believe that even in such cases the diagnosis should not be concealed but a more widely spread view is that the decision must be made by the doctor depending on the specific circumstances.

Finally, medical ethics has to be developed as a guideline in biomedical research and experimentation. The general rule is to reduce experimentation with humans to a bare minimum while making full use of experimental animals and advanced simulation experiments during which various models of organism responses and diseases are developed and the behaviour of these models is studied in the presence of perturbations.

As noted, the discussions and advice on these issues place strong emphasis on informed consent. This principle implies, in particular, that non-therapeutic experimentation, the objective of which is expansion of scientific knowledge, may make use

of volunteers alone. In real life the experimental subjects are chiefly the doctors and medical students. In therapeutic experiments, which are assumed to result in improving the patient's state, informed and voluntary consent of the subject is sufficient. If in the course of an experiment a choice must be made between the interests of the patient and of research, those of the patient must be preferred. In experimenting with children or mentally deficient subjects, when the consent is given by their guardians, the experimenter should make sure that the guardian is truly guided by the interests of the subject rather than by some attendant circumstances. Under no circumstances is consent given in return for promised material benefits regarded as voluntary. Neither medical nor general human morality allows experiments with prison inmates, such as those conducted in Nazi concentration camps during World War II. Even if the prisoner consents to experimentation, the consent cannot be regarded as voluntary. However, in discussing experimentation with prisoners, Lacroix finds certain complexities. "One can ask oneself whether these excessive scruples do not result in denying their fundamental rights to the detainees. Some of them may feel a strong desire to rehabilitate themselves. Would participation in a medical experiment, an act of altruism, not aid them in delivering themselves from the sense of uselessness and lack of dignity?"[29]

In discussing admissibility or inadmissibility, on moral-ethical and humanitarian grounds, of medical experiments with man, in particular numerous

psychological experiments which make manipulation of the personality possible, some researchers expressed a generally reasonable view that we cannot continue brandishing "the Galileo flag" and argue for "nothing but 'pure research'". They also believe, however, that today's science is breaking with the understanding of the social and human value of knowledge in the spirit of the Enlightenment and is about to follow the Kantian model in which knowledge and morals are not related directly or unambiguously. This issue will be dealt with later. At this point, let us only note that we tend to distance ourselves too drastically from the Enlightenment traditions of science by emphasizing that science in itself is neither good nor bad and that everything depends on its social environment. True, there are not only differences between science and morals but also contradictions because they are different forms of public consciousness. These contradictions are not, however, unresolvable antinomies. Montaigne was certainly right in stating that good people may have false convictions whereas an evil man may preach the truth though never believing it. Nevertheless, asserting full "ethical neutrality" of science means rejecting the understanding of its essence as a force at the service of man and his well-being and, consequently, a moral and humanitarian force which can either adequately express itself in a favourable environment or be distorted in an unfavourable environment.

This approach, which maintains a certain ideal of science, performs an important regulatory function and can be extended to the comprehension of

the socio-ethical and humanitarian principles (regulators) of today's science, which for this very reason must not be treated as something external for science and operating only at the level of the scientific community or society as a whole. The ethics of science cannot, therefore, proceed solely from the scientific cognition itself (or from the standards which guide it in the movement towards objective truth) or as a code of the scientist's behaviour which would treat him only as a member of the scientific community and society as a whole. On the other hand, these approaches cannot be isolated or, even less, be opposed to each other, presuming some kind of a science vs. morals dilemma. The ethics of science must unite them into an organic whole relying on the Marxist doctrine on the unity of scientific cognition and the value approach, on science as a social institution whose functions are dictated by the humanistic ideals dominating even "pure" research.

In this context, another important question arises: is the ethics of science self-contained? Can it act as the chief regulator of scientific cognition? Although the ethics of science is established as an essential condition for a humanistically-oriented scientific cognition and there is no alternative to this either for science or for humanity, science cannot be regulated only ethically. The ethical principles of science cannot be viewed in isolation from other factors which shape its value orientations, notably from social factors.

What has been said also dictates our attitude to the possibility and desirability of uniform ethical

codes for scientific research in areas vital for the current and future generations. Intensive research along these lines is underway, and several drafts, worthy of note, have been forwarded which, however, seem to be useful chiefly as incentives. One should not forget that science is essentially the search for new knowledge; consequently, it will forever produce unique, in particular ethically unique, situations which cannot be foreseen by any code. The highest priority now is to enforce more efficiently the observance of the existing socio-ethical and legal rules, codes and agreements.

In exploring the sociology and ethics of scientific research, notably of man, with a view to devising a Marxist interpretation of them, one should not ignore opponents of Marxism who try to prove that the latter is generally indifferent to these issues because of its "scientistic anti-humanism", neglect of the human problems, of the morality sphere, and the like. There is also a more general trend to "supplement" science with religious ethical principles as allegedly the only reliable guidelines for it.

Such attempts are responses to technocratic and scientistic trends in evaluating the development of contemporary science. Therefore, "analysis of conceptual and ethico-humanistic issues associated with the scientific and technological progress is inseparable from criticism of technocratism, ... scientism, and moral-ethical nihilism, extensively spread in the bourgeois philosophy of the West".[30] This issue is worthy of special treatment. Let us try and see whether science and ethics are alternative phenomena. In this way, the relationship of scien-

tific cognition and humanitarian values will be further discussed.

NOTES

[1]See: M.K. Petrov, "The Nature and Functions of Differentiation and Integration Processes in Scientific Cognition", in: *The Methodological Aspects of Interaction of Social, Natural, and Technological Sciences*, Moscow, 1981 (in Russian).

[2]V.A. Lektorsky, *Subject, Object, Cognition*, Progress Publishers, Moscow, 1984.

[3]Marx/Engels, *Werke*, Vol. 19, Dietz Verlag, Berlin, 1962, p. 362.

[4]Karl Marx, "Economic Manuscripts of 1857-58", in: Karl Marx, Frederick Engels, *Collected Works*, Vol. 28, 1986, p. 530.

[5]Karl Marx, "Economic and Philosophic Manuscripts of 1844", in: Karl Marx, Frederick Engels, *Collected Works*, Vol. 3, 1975, p. 298.

[6]See: *Communication in the Science of Today*, Moscow, 1976 (in Russian).

[7]These issues are discussed in I.T. Frolov, *The Progress of Science and the Future of Mankind*, Moscow, 1975; idem, *The Prospects for Man*, Moscow, 1979; 1983 (both in Russian).

[8]Karl Marx, "Economic and Philosophic Manuscripts of 1844", pp. 276-77.

[9]V.I. Lenin, "Materialism and Empirio-Criticism", *Collected Works*, Vol. 14, Progress Publishers, Moscow, 1962, p. 122.

[10]Georg Wilhelm Friedrich Hegel, *Encyclopädie der philosophischen Wissenschaften im Grundrisse*, Leipzig, Verlag von Felix Meiner, 1920, p. LXXVI.

[11]Karl Marx, *Theories of Surplus-Value*, Part II, Progress Publishers, Moscow, 1975, p. 119.

[12]V.I. Lenin, "Materialism and Empirio-Criticism", p. 137.

[13]V.I. Lenin, "Conspectus of Hegel's Book *The Science of Logic*", *Collected Works*, Vol. 38, 1976, p. 201.

[14]Karl Marx, "Economic Manuscripts of 1857-58", in: Karl Marx, Frederick Engels, *Collected Works*, Vol. 29, p. 98.

[15]Mikhail Gorbachev, *Political Report of the CPSU Central Committee to the 27th Party Congress,* Novosti Press Agency Publishing House, Moscow, 1986, pp. 24-25.

[16]B. Glass, "A Practitioner's View of the Biological Sciences", in: *Mind, Science, and History*, ed. by Howard E. Kiefer and Milton K. Munitz, State University of New York Press, Albany, 1970, p. 209.

[17]Barbara J. Culliton, "Science's Restive Public", in: *Limits of Scientific Inquiry*, ed. by Gerald Holton and Robert S. Morison, W.W. Norton & Company, Inc., New York, 1979, p. 153.

[18]Ibid., p. 132.

[19]*Experiments with Man. Report of an Ecumenical Consultation*, ed. by Hans-Ruedi Weber, Friendship Press, New York, 1969.

[20]*WHO Chronicle*, Vol. 35, No. 6, 1981, pp. 212-215.

[21]P. London, "Experiments on Humans: Where to Draw the Line", in: *Human Life: Controversies and Concerns*, ed. by Bruce Bohle, The Reference Shelf, Vol. 51, No. 5, The H.W. Wilson Company, New York, 1979, pp. 146-150.

[22]See: A.F. Bilibin, G.I. Tsaregorodtsev, *On Clinical Thinking (A Philosophic Deontologic Essay)*, Moscow, 1973 (in Russian).

[23]See: *Relevant Ethico-Deontological Issues in Today's Medicine*, Moscow, 1983 (in Russian).

[24]Van R. Potter, *Bioethics – a Bridge to the Future*, Prentice Hall, Englewood Cliffs (N.J.), 1971.

[25]H.K. Beecher, "Ethics and Clinical Research", in: *New England Journal of Medicine*, 1966.

[26]M.H. Pappworth, *Human Guinea Pigs*, Boston, 1967.

[27]M. Lacroix, "La bioéthique et l'expérimentation sur l'homme", in: *Esprit*, Paris, No. 110, January 1986, p. 66.

[28]Ibid., p. 67.

[29]Ibid., p. 71.

[30]*Kommunist*, No. 12, 1986, pp. 5-6.

CHAPTER 3

Science and Ethics: Alternative or Interdependence? Humanistic Ideals Versus Scientistic and Technocratic Idols. The Ethics of Science and Common Socio-Ethical and Humanistic Values

In the preceding discussion, we described the situation which makes the problems in the ethics of science today especially relevant. An attempt was made to formulate the premises for further analysis of discussions of these issues. At this point, let us proceed to the comparison and critical analysis of conceptions advanced in the discussions. In this way, our own views will be represented in more detail, in particular, in order to lay the groundwork for further discussion. Of course, our arguments do not add up to a final solution of complicated and multifarious problems in the ethics of science. On the other hand, a broad and open discussion of these issues is vital for self-awareness of science. For this reason, discussions on the ethics of science should be evaluated more in terms of the incentive role they play in shaping the social responsibility of scientists rather than in terms of their ability to provide final answers or facilitate the formulating of uniform codes of scientific behaviour.

Let us begin with most general aspects in the ethical problems facing science. One of the key is-

sues which are most frequently raised in this context is the relationship of science and ethics, the ideals and standards of science and the moral values of humanity. It is important to see both the overall changes in the treatment of these problems over the recent decades and the differences of opinions, largely attributable to the philosophical views of their authors. Let us first discuss an article which Henry Margenau, a US physicist and philosopher, wrote back in 1947.[1]

In describing Western culture he advanced an "unpopular", in his own words, view "that places scientific method in the center of interest, leaving philosophy, esthetics and religion in the background of the cultural scene" (p. 225). For this reason, the basic features of Western culture manifest themselves most vividly in the methodology of science while "the term science ... should signify what is more definitely called rational, or theoretical, science", thereby social science and psychology are left out and "their present state is more like the condition of geometry in pre-Pythagorean times" (p. 228), as are history and anthropology which "have hitherto been disciplines largely marked by creative impotence, except in so far as they give satisfaction to scholars" (p. 226).

It is not surprising that in the framework of this scientistic approach, the relationship of science and ethics (and Margenau is convinced that they are compatible) is viewed only from one angle: "Can the method of science, in particular of theoretical science, be applied in ethics?" (p. 225). Although he believes that "science is ethically neutral" because it acts as a mere tool once the ethical choice has been made, and "It is therefore improper to speak loosely of a 'scientific code of ethics'" (p. 236), Margenau thinks that the scientific method can indeed be applied to ethics and proposes, in effect, creating a science-based ethics. In its present-day state, ethics is in his view outdated because it does not meet the standards of "theoretical science".

Such views were fairly widely spread in the 1940s and 1950s. A change took place as early as in the 1960s. In his paper of

1966, Margenau, who has not discarded the view of moral neutrality of science, reasons in quite a different way when he speaks of problems facing man today: "Enabled by science to accomplish ever greater and more massive tasks, saddled with an increasingly awesome responsibility, he discovers that his very source of power leaves him without moral guidance. This is why the scientist today, more than ever, needs the counsel and the guidance of the humanist".[2] There is no question now of restructuring ethics to suit the standards of "theoretical science"; science itself needs humanitarian guidelines, above all from the humanities which used to be neglected.

A broader treatment of the science-ethics relationship is provided by Robert Cohen, a US philosopher.[3]

He does not confine himself to discussion of the potential of scientific methods in the development of ethical theory. He takes note of a number of relationships between science and ethics: (1) scientific discoveries may compel people to make ethical decisions; (2) they make some ethical decisions possible; (3) scientific methods may prove helpful in the reasonable control and ethical planning of social and private life; and (4) science is capable of suggesting a model of a democratic way of life to whoever wants to have such a model.

Speaking of the history of science-ethics relationship, Cohen mentions the close link between theories of cognition and ethical theories, the dominating influence science has on ethics, and argues that the idea of causality, so important in scientific cognition, originated in the ethical concept of retribution. He also notes serious, nearly conflicting, differences. Whereas a few centuries ago science was assumed to be essentially good, today the European civilization is torn by terrible deformities. According to Cohen, science is in itself morally neutral but being unconstrained it is as dangerous as it is powerful and irresponsible.

Cohen's position is, in our view, somewhat abstract. We have noted the dialectic interrelation-

ship of the ends and means in the activities of man and society. We have argued that as science develops humanity may pursue goals which used to be regarded as unthinkable or unattainable and that science cannot be viewed today only as a set of means, as it is treated by Cohen. Indeed, if all cultural and conceptual functions of science are taken into account, there is more to it than the supply of means to achieve exogenous ends. This is especially obvious if the sphere of science includes the humanities, as well as the natural sciences, notably the humanities dealing with ends and values. Cohen's position is also abstract in an attempt to treat the science-ethics interrelationship in terms of their universal definitions. However, in today's social practice and science, this is quite a specific issue which covers definite fields of knowledge and scientists and has a strong impact on their scientific activities. Later, we will again discuss the question, in what sense can science be regarded as ethically neutral. At this point, we will only note that in recent discussions this viewpoint has come under repeated criticism.

Let us consider the views of another scientist, Victor F. Weisskopf, a foreign member of the USSR Academy of Sciences. His book[4] includes two articles on the ethical problems of science, "Science and Ethics" (1968) and "The Significance of Science" (1970-1971). It was in those years that various anti-science movements gained momentum in the West. At the same time, the USA and other capitalist countries began cutting their scientific budgets, scientists were losing their positions,

and voices were heard which demanded halting the development of science. The scientific community in the West was taken by surprise. Some scientists went as far as doubting that they could find a justification of scientific activity, which would make it possible to come to terms with their consciousness. Thus, while the first of the articles mentioned above is couched in more or less academic terms characteristic of conventional papers on the problems of the ethics of science, the other one is highly emotional.

The first article is written by an author convinced that his reasoning and evaluations are indisputable: "The problems of the improvement of the human condition must be attacked today on the political, sociological, and economic level. Science and technology have done their part already" (p. 329). "It is clear, however, that not everything is desirable which is technically feasible" (p.334). "Perhaps one can achieve an acceptable rate of change in our cultural patterns by a selection of fields in which progress should be supported or retarded" (p. 334).

His other article is quite different. It is no accident that one of its epigraphs is from the Ecclesiastes, "For in much wisdom is much grief and he that increaseth knowledge increaseth sorrow" (Ecclesiastes, I, 18). There is no longer a question of science having done its part. Weisskopf notes that the problems facing humanity must be solved by using the methods and findings of the natural sciences but on numerous occasions these are insufficient if not inapplicable. Although "new scientific knowledge is neither good nor bad" (p. 343), "there is a broad spectrum of relations, philosophic, social and ethical, by which science influences and is influenced by society. The significance of science becomes evident in the numerous, often contradictory, ways in which it interacts with the affairs of men" (p. 362).

This position of science in society makes it far from ethically neutral; consequently, scientists have to carry a heavy

burden of responsibility. Weisskopf is most concerned over this: "The human problems caused by the ever increasing development of a science-based technology are too close and too threatening; they overshadow the significance of fundamental science as a provider of deeper insights into nature. The scientist must face the issues raised by the influence of science on society; he must be aware of the social mechanisms that lead to specific uses and abuses of scientific results, and he must attempt to prevent the abuses and to increase the benefits of scientific discoveries. Sometimes he must be able to withstand the pressures of society toward participation in activities that he believes to be detrimental... It puts the scientist in the midst of social and political life and strife" (pp. 357-58).

This by no means relieves the scientist from responsibility for the development of scientific knowledge as a cultural legacy, an "eternal treasury of humanity and an important social fund". Rather, this increases his duty to propagate knowledge through teaching and popularization. Such is Weisskopf's view. However, although he poses truly acute problems, such as the struggle of scientists against the arms race, the need for their active participation in harmonizing the relations of man with nature, still he cannot indicate the social forces or conditions which might be helpful in solving the vital problems brought about by the progress of science and technology.

Let us discuss another range of conceptions. As was noted in the preceding chapter, the discussions on the ethics of science centre increasingly on problems generated by the development of biology and sciences of human behaviour. These discussions brought the relationship of science and ethics

to the top of the agenda. In his sensational book[5] Jacques Monod, French biologist, explained his general philosophic conception which opposes dialectical materialism. The book, in particular its treatment of science-ethics relationship, was critically analyzed in Soviet literature.[6] His views are worthy of at least a brief description because they are reiterated by numerous Western authors.

Monod asserts that the human need to search for the meaning of life, which gave birth to all myths and religions, all philosophic systems and science itself, is recorded in the genetic code. For hundreds of thousands years, man's destiny was identified with that of his group, his tribe, outside which he could not exist and which by necessity had to be united. Thus, the laws which ensured that unity were highly significant subjectively and were never doubted. According to Monod, this influenced the genetic evolution of "in-born categories" of human reason and generated the need of a mythic explanation. The creation of myths, religions, and philosophic systems is the price man had to pay for survival as a social being. They provide explanations designed to "alleviate the anguish", or satisfy the need to search for the meaning of life. They relate human history to the history of cosmos which thus acquires a standard-setting character by revealing the value of man and his place in nature. Thus, the "animistic tradition" was born which, according to Monod, dialectical materialism inherits because of its "non-scientific" and "ideological" nature. Dissociation from the tradition, establishment of objective cognition as the sole source of genuine truth is Monod's programme for a new stage of the "era of ideas". He believes that today's science breaks the old "animistic link" between man and nature and for this reason cannot assuage his "in-born anguish" or win his soul and instead finds its place in the sphere of practice.

A final dissociation from the "animistic tradition" calls, according to Monod, for a complete revision of the fundamentals of ethics, the entire system of values which has so far been guiding humanity. What is more, a new relation between

ethics and knowledge, objective truth and the value approach will have to emerge. While in "animistic conceptions", ethics and knowledge are viewed as two aspects of the same reality, the postulate of objectivity establishes a basic difference between them, which is indispensable for studying truth itself. For this reason, knowledge eliminates every kind of value judgement. Ethics, being non-objective, is for ever eliminated from the sphere of knowledge. On the other hand, Monod asserts that although true knowledge does not recognize values, it needs a value axiom for its genesis; the very acceptance of the postulate of objectivity as a condition of true cognition relies on a value foundation, on assignment of a value to objective knowledge. For this reason, to accept the postulate of objectivity is to express the overriding postulate of the ethics of knowledge which is different from the "animistic ethics" in that it is the ethical choice of the original value that is the basis of cognition.

No system of values can claim to be the true ethics if it does not offer an ideal which is transcendental (exogenous) of the individual to an extent that it would justify his self-sacrifice under certain circumstances. Unlike the "animistic systems" which play down the biological specifics in man, the ethics of knowledge encourages, according to Monod, respecting these traits and, where necessary, overcoming them. It demands that man be regarded as a being who belongs to both the biosphere and the world of ideas, is tormented by this duality and develops by expressing himself in art, poetry, and love. Monod ends his ode of the ethics of cognition with a conclusion that in his eyes it is the sole rational and ideal stand. He opposes it to the Marxist stand which is allegedly based on an "animistic ideology" rather than on science and which allegedly confuses the categories of value and knowledge. Monod defends what is essentially a scientistic concept of "pure knowledge" which is unrelated to human ideals and is generally alienated from man, his subjective world, needs and aspirations.

A somewhat different position led Gunther S. Stent,[7] a US geneticist, to similar conclusions. He believes that European science and European morals are in conflict. The anti-science movements

mentioned earlier have undoubtedly made a deep impression on him. But while Weisskopf advocates the value and significance of science for humanity, Stent is more "radical" and does not agree with those representatives of the scientific community who, in his words, continue righteous preaching in order to defend the Baconian faith in science giving grounds for hopes for a better order in the world.

Stent presumes that morals and science have a common origin, the human reason. Because of the paradoxical nature of reason, morals and science are associated through their fundamental similarity, internal dissimilarities, and incompatibility. The internal dissimilarities do not hinder the formation of a superficially consistent picture of reality designed to develop a rational behaviour in everyday life. They do not emerge unless scientists and philosophers go too far and deep in their analysis. The inconsistencies and unclear points thus revealed can be eliminated by changing certain basic intuitive postulates of the world. Such postulates would, however, strongly affect cognition because they would increase human alienation from reality.

According to Stent, the scientific approach to the world, with which we establish and try to comprehend the reality of objects governed by causal relations, is just one of the two aspects of the global intuitive ideology that directs our activities. The other aspect is the ethical approach which shapes interpersonal relations. The concepts underlying the ethical approach contain numerous implicit assumptions. Thus a picture of reality is pieced together that is characterized by internal inconsistencies and which is incompatible with that obtained by the scientific approach. Physicists and mathematicians have brought to light the premises implicit in the concepts of time, causality, etc. In the same way, the philosophers attacking the issues of morals must have explained the assumptions embodied in morals.

Stent proposes to address the Oriental philosophy, in particular Buddhism, Taoism, and Confucianism, with its view of

the moral issues, which differs from the Western view, in order to resolve the paradoxes attributable to the specifics of human reason. According to it, goodness in itself does not signify an ability to construct objectively correct moral judgements. Moral behaviour is not regarded in terms of choice and responsibility because the path to harmony with the world is not believed to have crossroads. The central issue of the Oriental morals is not the responsibility of an individual for what he does of his own free will but whether he has correctly studied the indicated path, whether he is willing to learn diligently. Since the knowledge of the path is already in us, goodness arises from cognizing oneself. People may improve themselves through self-development. In conclusion, Stent says that man who has acquired reason in his childhood can suppress it and overcome in this way the tormenting paradoxes ensuing from rational thinking; but this apparent freedom from conflicts would be born at an exorbitant price of destroying the fundamentals of science and ethics.

Such views have a measure of following in the West, in particular among scientists. Culture seems to be understood as a mechanical mixture of components which may be removed and replaced with other, borrowed ones. In refuting this approach, Marxists show that the dilemma of science and morals can be resolved by *scientific* means without resorting to mystic intuitive structures and that the scientific solution, rather than being in conflict with the cultural traditions, naturally derives from them. These traditions (of the world, not of the European or Oriental culture alone) are inherited by Marxism.

Of course, in the framework of Marxism, different approaches are possible to the science-ethics relationship. Some were advocated in a typical discussion conducted by *Voprosy filosofii* journal on "Science, Ethics, Humanism",[8] which largely stimu-

lated the subsequent debates among Soviet scholars on the issues of science and ethics such as the Third National Conference on Philosophical Issues in Today's Natural Sciences.

W.A. Engelhardt believes that science in itself does not create ethical values; the only value it produces is knowledge which overcomes ignorance to introduce order in human ideas. The cognition of the world is infinite, and it is this continuous growth that makes knowledge as a science-generated value different from all other values created by man's inner world. Conversely, ethical values have a certain dimension and stability. A.A. Malinovsky who agreed with Engelhardt that the natural sciences do not contribute to the development of ethical conceptions, noted that ethical values have a major role to play in the development of science itself by improving its efficiency. He drew attention to the fact that eminent scientists who create major scientific values are, as a rule, kind and highly ethical people.

T.I. Oizerman said that science has to be viewed not only as a means of cognition; scientific activity also shapes a certain kind of person and the associated ethical standards and produces the highest ethical values. But B.M. Pontekorvo noted that a more humane type of person cannot emerge by virtue of being engaged in some kind of scientific activity.

M.V. Volkenshtein suggested that science is not merely a body of knowledge but includes creative activity, the associated social institutions and forms in which humanity interacts with the Universe and itself. In this sense, science is inseparable from ethics. The basic ethical categories science deals with as a form of human activity, are truth (and search for truth) and harmony (and search for harmony) in the surrounding world. B.M. Kedrov pointed out that, having a certain role to play in social life, science, although it does not create ethical values, by discovering the objective truth develops principles which serve some purposes for one class and other purposes for another class. In this way, science manifests its social role which, in a final analysis, cannot be separated from its content.

The discussion of Soviet philosophers raises the question of the humanitarian function of science which must manifest itself in solving its basic problems and of the discrepancy that often appears between the real science of today and this ideal model. N.V. Motroshilova emphasized the need to see whether science is capable of humanitarian self-control, whether the participation in scientific activities is a guarantee of humanism or whether science itself does not produce either good or evil and the decisive role is played by some exogenous force which exists beyond the motivation and technology of scientific search as such, and by the regulatory activity of the scientist. She feels that our times reveal positive trends in this respect and certain facts suggest that humanitarian considerations will increasingly penetrate into the very structure of science as standards influencing specific research projects.

M.A. Lifshits said that the quest for truth and the ethical aspect of cognition, its humanitarian thrust, may come into conflict. To obtain truth in full as the objective of knowledge, certain aspects of research may have to be limited. Science as a social force rather than the quest for truth needs public control. M.V. Volkenshtein who agreed with this idea asked: what has to be controlled, science or its application? In his view, it is the latter. In this context T.I. Oizerman noted that application of science may in turn become a field of research. Science, like any other sphere of human activity, is associated with certain human relations, including their moral aspects. Viewing science as a mere tool at the "service" of man or truth, is insufficiently specific. It is necessary to disclose the multifarious content of these concepts and the social and philosophic positions of scientists. W.A. Engelhardt also emphasized the significance of the scientists' social responsibility. As regards good and evil as fruits of science, these become evident in the actual interrelationships between science and its technological applications. In his opinion, the possibility of obtaining positive results is inherent in the very nature of scientific search, and the danger is exclusively in the actions of human society which is capable of preventing it.

Defining the process of cognition as something "dimensionless", M.K. Mamardashvili believes that science is a

human value as long as the knowledge it discovers and the associated states of human consciousness cannot be assigned any value dimension. The essence of science is, in his view, relying on the available knowledge and observations to obtain new knowledge.

E.Yu. Solovyov argued that the specific feature of today's discussions on the possibility of the humanitarian orientation of science lies in closely associating and even identifying science and technology, therefore ethico-humanitarian evaluations of scientific knowledge include essentially different approaches to reality, although merged into a single whole. Technology is chiefly the "culture of tools" and to explore the reality technologically is to view technology in terms of its utility, its usefulness, measurability, and instrumentality. Science, on the other hand, seeks to know the reality "as it is", as it exists apart from human interests and needs and even despite them. Science takes reality as an independent existence and, in marginal cases, poses the problem of its preservation and reproduction in the context of a techno-pragmatic expansion. The fears so dramatically expressed, for example, in today's ecology, seem to be a manifestation of the general inner spirit of science which wants to preserve life as it exists independently of human consciousness and will.

V.Zh. Kelle insisted that science can only develop as a continuous knowledge-producing process, knowledge being "dimensionless"; in this sense science is neutral as regards good and evil, and is ethically sterile. On the other hand, the amount of knowledge acquired by science calls for some mandatory control standards, not only those ensuring knowledge production but also those which would effectively limit the development of some scientific disciplines.

Because anti-humane utilization of scientific findings is evidently of extra-scientific nature and is dependent on the socio-cultural background and science-managing mechanisms, extra-scientific factors are presumed to act as control measures. In this form, the problem amounts to mechanisms of social involvement, management and utilization of science. In this respect, according to E.Yu. Solovyov, it is the social organization of science and the way it is related to technology and economics, rather than science itself, that need ethics-wise control. A new type of activity, a new type of experimentation

and a new type of organization of scientific search are predicted under which the scientist has to prove the social significance of scientific discoveries' applications and their consistency with vital human values, and to provide safeguards against anti-humane utilization of research findings. The effectiveness of such control, which would incorporate ethico-humanitarian criteria, will largely depend on the participation of leading scientists concerned with the problems of social organization of science and on the strength of the union between science and democracy.

These ideas were in some form supported and extended by other participants in the discussion. In particular, E.G. Yudin noted that the involvement of science in man's objectives links it with morals and values, for the supreme regulators of the system of objectives are value and moral principles. The problem arises, in his opinion, because science in itself, as a system of theoretical knowledge, does not contain a universal scale of values or moral standards. For this reason, the theoretical programmes of activities developed by science are in one way or another amended by the actual scales of this kind operating in society, above all, by social and class factors.

In respect to the essence of the discussion on the relations between science and ethics, V.M. Mezhuyev pointed out that the admissibility of experimentation on man is an important but narrow issue while the overriding question is whether science could be the sole guide of man and whether man could rely entirely on scientific judgements. Probably not. Morals and arts, as well as science, have to provide guidelines of human behaviour and compose the basis of human culture. Unity of science and morals as the core of humanism was emphasized also by V.S. Markov. Yu.A. Zamoshkin argued that discussions of inadmissibility of certain experiments with man are concerned with issues not so much in the ethics of the scientist or science, as in the value orientation of the social system in which science is one of the elements. In this sense, a democratic control of science is also an issue in the functioning of the social system.

The discussion was then continued by Soviet philosophers in *Voprosy filosofii* and in *Voprosy is-*

torii yestestvoznaniya i tekhniki (No. 4, 1980; No. 2, 1982, etc.).

Socio-ethical problems of science are also discussed at international meetings. UNESCO initiated numerous projects, in particular in genetics and ethics. The socio-ethical issues were also discussed by the 16th International Congress of Philosophy, in particular at sessions on the "challenges" biology offers to philosophy. These problems were taken up at the Seventh International Congress of Logic, Methodology, and Philosophy of Science held in Salzburg, Austria, in 1983.

Jean Ladriere of Belgium, who presented a paper on "The Ethical Dimension of Knowledge", noted that the problem of the ethics of science has a bearing on science itself rather than on its applications or consequences in other areas. Indeed, the ethical issue arises where there is responsibility. The responsibility of science has two dimensions. One is the responsibility for its own development. The other is indirect responsibility in the situation of "possibilities". Science makes possible certain activities which do not belong in the sphere of science but could not take place without it. In effect, Ladriere distinguishes the internal and external responsibilities, the former being more important.

Ladriere believes that the underlying principle of the ethics of science has to be determined in the cognition process. It can be stated as follows: the genuine duty of science which expresses its specific ethics, is to ensure free manifestation of its epistemological (related to obtaining true knowledge) standards. Two requirements have to be met. On the surface level, loyalty to the standards of critically justified research which have already been comprehended and, on the profound level, continuous effort to update the existing and introduce new standards to make science increasingly adequate to its goals.

The external responsibility owes its existence, according to Ladriere, to the fact that cognition may bring about situations

which in other respects are inadmissible. True, science must be responsible for such situations but this does not mean that it should retreat. Besides, one cannot know in advance what will become possible when a particular research project yields results. Science must show a responsible approach by being aware of the role it actually has to play in the emergence of possible dangers, by informing the public of what is at stake and of the inevitable consequences, and by looking for ways to limit the risk and, if possible, prevent potentially dangerous situations. This, Ladriere believes, is the business of science itself. However, thanks to its inherent ethical dimension, science must occasionally depart from its own field in order to use its method and spirit to help other fields where the science-created possibilities threaten devastating consequences.

In other words, the ethics of science calls for an integrated approach whereby science must nest in the integrity of existence, of life. Science has an ethical dimension, in the final analysis, only insofar as it is bound to overcome itself in the integration movement which could be referred to as "wisdom".

Ladriere's views, which are sometimes couched in fairly abstract and vague terms, include, in our opinion, certain essential points such as an attempt to identify the inherent ethical dimension of scientific activity and the understanding of the social responsibility of science, which does not discard issues pertaining to the consequences of applying the scientific findings and to scientific cognition as a search for truth. He emphasizes the responsibility of science as such and not only through the technical means it makes possible. On the other hand, Ladriere places the responsibility on science rather than scientists; as a result he fails to demonstrate the practical significance of, or at least outline ways to solve, the specific issues which, in fact, make up today's ethics of science. He makes no effort to un-

cover the mechanisms which could link the responsibility of science as a whole and that of the scientists. This makes his analysis neither specific nor realistic.

Other aspects of interrelationship between science and ethics were discussed in a paper on "Ethical Aspects of Non-Ethical Theories" read by Marian Przelecki of Poland. In his view, the actual objects of moral evaluation are human activities and, consequently, the people who carry them out. Therefore it is not the theory itself but the act of putting it forward that can be evaluated in moral terms. As far as scientific (non-ethical) theories are concerned, the act of projecting them is morally neutral. Nevertheless, some ethical significance is attached to theories which seem absolutely free of any ethical assumptions. Some scientific theories are accused of "legitimizing" morally questionable activities, guidelines or policies. Two such cases were discussed in the paper. One is the theory of inherited intelligence which is often viewed as a theory legitimizing discrimination of certain ethnic groups. The other is the evolution theory which was viewed from the very beginning as the core of an "evolutionary ethics".

Analysis of such cases reveals, as a rule, logical fallacies: the scientific theory which is used to justify a moral evaluation does not in fact justify it. The error may originate from a fallacy in the reasoning,or the moral evaluation is derived, as well as from the theory, from certain additional implicitly ethical assumptions. Rather than denouncing certain theories, the implicitly ethical assumptions have to be unravelled and denounced. This does not signify, however, that the scientist is indifferent to social utilization of his theory even if this develops from fallacious arguments. He must be an interested party but more as a citizen than a scientist. In this sense, the philosopher has a duty to study and criticize attempts at justifying certain activities, guidelines and policies by scientific theories. We feel that Przelecki is right in countering direct justification of moral evaluation by the authority of scientific theories.

In general, philosophic thought has long since embraced the absence of logical link between the proposition on the world of things (or the specific scientific knowledge) and the proposition on what must be (or moral judgements). Indeed, the link between scientific knowledge and ethics is not obvious (incidentally, superficial treatment of this link is a root of pseudo-science discussed in the preceding chapter). To reveal it, knowledge-producing activities should be given more attention than scientific knowledge itself. These activities are necessarily pursued by a specific individual as an integral personality in whom the difference between "the scientist" and "the citizen" is purely analytical, because it is often difficult to establish where the scientist ends and the citizen begins. Besides, the scientist as such cannot escape the responsibility for the way the specific knowledge in which he is competent is functioning in social life. The authority of the scientist is a force to be reckoned with and capable of counteracting reactionary or unjustified moral prescriptions and "practical advice" pronounced allegedly on behalf of science. In other words, there are issues which can be referred to as social rather than cognitive and which can be solved by scientists alone.

Ethical principles are extensively discussed even at those meetings which used to take up special logical and methodological problems of science.

The relationship of science, ethics, and humanism also attracts the attention of the World Council of Churches which has invested a good deal of

research, in particular, into the admissibility or otherwise of experiments with man.[9]

"The Church and Society", a document adopted by the conference on technology, faith, and the future of mankind, admitted that scientific discoveries, notably in the field of human genetics and especially the outlook for their utilization, had placed the theologians into an embarrassing position because there had been no precedents to rely on in answering these questions. Theologians emphasize the dominating role of the moral aspect; they presume that by virtue of its "limited scope" science cannot take up the supreme guidance of life. As science is a mere tool which man can use "for diametrically opposite purposes", an ethical control of it and its application is necessary. A similar viewpoint was advanced in a report of the World Council of Churches entitled, "Genetics and the Quality of Life", which argues that neither Christians nor humanists can face the future relying only on the authority of the past. A humane decision calls for competent scientific knowledge but knowledge itself is not a moral wisdom or the ability to comprehend human values.[10]

In assessing the theological approach to problems in the ethics of science, one has first of all to note its abstract nature in the reasoning on ethical control as well as on moral issues. It has also a peculiar kinship with scientism which contrasts cognition with values, science with humanism; theologians need scientism to "supplement" it and thus prove their own worth.

This is corroborated, in particular, by a symposium convened on the occasion of the 350th anniversary of *Dialogo dei Massimi Sistemi* (Dialogue of the Two Chief World Systems) by Galileo Galilei. Pope John Paul II said that whereas in the past there was a "serious misunderstanding" between science and faith, today this can be overcome by recognizing that different approaches are characteristic of different orders of

knowledge. What did he imply? According to him, the church has been learning from experience and reflection and now has a better idea than before of what is to be understood by freedom of research. The Pope thought that there could be no real conflict between science and faith, the two different orders of knowledge which facilitate a deeper insight into the "integral reality" created by God.

Characteristically, Pope John Paul II chose the "case of Galileo" to "reconcile" faith and science. According to him, today the "greater susceptibility" of scientists and researches to spiritual and moral values gives science "new directions" and requires a fuller perception of that which has "universal significance". This also broadens the scope of the dialogue between science and the church. Calling for a "deeper specialization", the Pontiff laid special emphasis on the fact that science and technology have become an efficient force and a subject of socio-economic strategy which strongly affects man's future. In this context, the world of science reveals the magnitude and significance of its responsibility; profound moral change is necessary if the scientific and technological resources of the world are to serve mankind. John Paul II called on scientists who, in his words, have a strong moral influence to work for humanistic and cultural objectives of science.

In the above reasoning, the ethical dilemmas of today's science are taken up for the purpose of safeguarding the positions of religion, its "modernization", its "readjustment" to the needs of science which addresses itself to man, his moral world and value orientations. Therefore, scientists must redouble their efforts to solve the issues in the science-ethics relationship and at the same time to counter the designs of religion to monopolize the field for the solution of these problems.

In this light, a discussion on "Science and Ethics" at the 22nd Pugwash Symposium, held in Dubrovnik, Yugoslavia, in 1975, which attracted most

diverse points of view, is very interesting.[11] The participants agreed that scientific and technological progress brought about numerous undesirable consequences such as, for example, the development of increasingly devastating weapons, the widening gap between industrially developed and developing countries. While disagreeing on the causes and sources of these phenomena, the scientists were unanimous that further progress in science and technology could not be viewed as an end in itself and that it should be reoriented so as to use the achievements of science and technology exclusively for the benefit of mankind. The social responsibility of scientists and the possible social mechanisms which would transform it into a means of efficient control of the trends in scientific and technological development, were the issues that evoked heated discussion.

Ivan Supek of Yugoslavia who opened the discussion challenged the alleged neutrality of science. "When we raise the question of the relation of science to ethics, we must first bridge the chasm which speculative thought has dug between objectively oriented investigation and moral valuation. If at the very beginning we take science as something distinct from ethics, then we will build bridges in vain" (p. 19). According to Supek, science is a field where human aspirations are applied driven by curiosity, common effort, doubts, value judgements, i.e. everything that fills our everyday activities. The gap between science and ethics is attributable to the view of science as a logical deductive system where something is derived from basic principles and laws. This conception is backed up by classifying science into "pure" and applied, assuming the former to be engaged solely in search for truth and the latter, serving social interests. Consequently, only applied science can be judged ethically while pure science is beyond

any moral convictions. This view, according to Supek, is fallacious and its origins can be traced to the positivist philosophy.

This conception indeed proceeds from a very simplistic view of the cognitive activity and downgrades the researcher to the status of an automaton. There are still many adherents of this view although the latest methodological studies have convincingly revealed its inconsistency with the realities of scientific cognition. According to this view, the researcher is supposed to be sharp-eyed but have no imagination. Creative activity can only spoil the picture of things or the description of facts. This view leads to a gap between science and art because it obscures their common sources, as well as between science and ethics.

Science, Supek insists, is not tracking and photographing some eternal and self-sufficient truth; science can rather be understood as a human creation, as human activity which has its own history and in its own way predicts the future. Once this is understood, we will not push ethical principles out of science but will detect moral imperatives in our research activities. Science is a cooperative activity of researchers who establish universal criteria and formulate problems.

Supek identifies some ethical, in their nature, principles of scientific activity such as tolerance, the critical spirit, rejection of all kinds of prejudice and bigotry. These principles, he believes, must be employed also beyond the framework of science, in the relations between nations, in combating religious fanaticism and dogmatic ideologies. "In the same way, imagination, so highly developed in science and art, makes it possible for us to see things differently, and so find a way out of the most acute crisis. If our thought were a mere outgrowth of the reality or society in which we live, we would be unable to understand completely different civilizations, nor could we creatively change the world" (p. 21).

It should be emphasized that numerous modern (and other) critics of science essentially identify it with classical natural science which inclined to mechanism and tried to explain all phenomena and objects in terms of Newtonian physics. As a result, the guidelines of scientific cognition at a certain

stage in the development of science (although even at that time their authority was by no means absolute) are misrepresented as specific features of scientific cognition in general and a conclusion is made that science inevitably brings about a disinterested narrow view of reality and kills creative imagination. This criticism is, however, largely the direct opposite of the truth. Whoever knows the variety of the theories of gravitation in the framework of today's physics, the broad spectrum of concepts of the origin, evolution, and structure of the Universe in today's astronomy, the differences between theories describing the biological evolution, would hardly take such views of science seriously. The real, rather than a grotesquely oversimplified, science is at any point in its history aware of the incompleteness of the available knowledge and is not inclined to give it an absolute value. True, scientific knowledge is built on and evaluated by numerous methodological standards (which also change in the course of history). But cognition cannot simply follow these standards. It is invariably a breakthrough beyond existing knowledge and for this reason a creative activity which makes high demands on imagination. Supek is quite right in insisting that this work of imagination is essential in the search for solutions to the global problems of today.

The scientific and technological revolution made moral conflicts especially acute. Scientists, Supek notes, cannot argue any more that they are engaged in pure, abstract research whereas engineers and inventors serve industry and the military. "You may be completely uninterested in practical

matters, but, as soon as you publish anything, it can be used for vastly diverse purposes" (p. 21). Today, he believes, in addition to individual moral responsibility, an increasing importance is acquired by collective responsibility of scientists, which requires a unified approach. The ethics based "on the actions of individuals can throw but a poor light on these critical situations" (p. 22). Responsibility of scientists presumes their active participation in the solution of the most vital problems of today. New ways to improve life must not only be sought but also implemented; the entire creative potential should be brought into action if the human lot is to be improved.

The 1975 Pugwash Symposium heard various views on the science-ethics relationship and the social responsibility of scientists. It was informed of UNESCO-sponsored projects dealing with the study and evaluation of the social consequences of the technological progress. In 1975 UNESCO launched a project on "Science in the Contemporary World: Human Implications of Scientific Advance". Its basic premises were as follows.

"Science and technology have become simultaneously the greatest hope for human progress and one of the most serious threats facing contemporary man. This situation has arisen from the immense power of scientific technology, whether it be directed towards the elimination of human disease or the manufacture of weapons capable of eliminating the human race. In some cases the results of technology have contradictory implications. One result of this, particularly in the developed countries and especially among the young, has been a growing mistrust of science and its applications. This phenomenon is occurring at a time when the planet has to support 4,000 million [now 5,000 million.—*Authors*] people and can do so only through a sustained and rational use of technology. Yet the reckless use of a technology geared primarily to exploitation is equally threatening. Only if science and

technology can be brought under firm and humane control can catastrophe be avoided.

"In the developing countries, the situation is if anything more serious. There, the promises of science and technology have not been fulfilled: poverty, famine and disease are still the lot of the majority of the human race. Without science and technology this situation can only worsen."[12]

Then, the document surveys attempts at controlling and guiding the development of science and technology in various countries. The UNESCO experts believe that social supervision must be the responsibility of those people, including scientists, who make decisions on the application of scientific findings. In the world of today, science must concentrate on social needs and vital problems of peace. In particular, in the framework of the project, UNESCO studies the cultural, ethical and esthetic issues arising in the development of both conventional and new scientific disciplines and technologies.

We have noted earlier that disappointment caused by numerous consequences of scientific and technological progress revived interest in the West in Oriental socio-ethical doctrines. For this reason, it seems appropriate to see how the scientists of the East treat the relationship of science and ethics. The promise and the implications of the scientific and technological revolution for the developing countries are by no means clear. "Before the developing countries the scientific and technological revolution is setting this most acute question: are they to enjoy the achievements of science and technology in full measure in order to gain strength for combatting neocolonialism and imperialist exploitation, or will they remain on the periphery of world development?"[13]

The values of the West and East can hardly be contrasted, for Oriental cultures do not make up to

a non-differentiable integrity and the difference between them may be as wide as between any of them and the Western culture. What is also important is that by criticizing Western values, some Oriental thinkers actually attack those of bourgeois civilization; on the other hand, such indiscriminate treatment of Western culture is also illegitimate.

At the 1975 Pugwash Symposium, scientists from Egypt and India also presented their views. A. Abdel-Malek of Egypt offered his approach to the history of science-ethics relationship, which compares the Western and Eastern traditions.

According to him, the view of science and ethics as two different and antagonistic fields appeared in modern European culture. Bertolt Brecht treated Galileo's story in this light as a tragedy of a great man torn by the collision of the right to scientific research and social and philosophic commitments. Galileo, and later others, took refuge in objectivism, abstention from political and moral issues.

According to Abdel-Malek, before Galileo, however, the situation was different. The scientist and the philosopher led an active life not as two individuals united by force but as persons integrated into society. In ancient and pre-Renaissance Christian Europe, "the conception of the man-as-scientist, as opposed to the man-as-philosopher, or moral philosopher, simply did not belong to the prevailing tradition of Western thought and social praxis as we know of it".[14]

The Oriental tradition, Abdel-Malek believes, developed continuously. Since the formation of the main Oriental nations around two homes of civilization, the Indo-Aryan and Chinese, and until now the social role of man of science and natural philosophy has been viewed quite differently. In all Asian, African and Arab countries the scientists look upon themselves as "natural intellectuals". Science must unravel the mysteries of nature and life and look for the truth. Truth

itself has forever been viewed as a specific national cultural formation within the framework of a totality of civilizations.

Consequently, science has been opposed to ethics only in the Western world and only since the late fifteenth century. The changes that occurred there at that time prepared the ground for the emergence of a specific stratum of the population engaged chiefly in intellectual activities, both scientific and ethical, who were to a greater extent than before separated from the structure of power but nevertheless completely dependent on it for their very existence, fame, influence, and promotion. Thus, modern intelligentsia emerged which enjoyed a greater degree of freedom of thought than before.

The period of great scientific discoveries began which were viewed as the chief means of developing the economy and industrial technology; it was also a period of acute large-scale conflicts between classes, nations, political systems and ideologies. The progress of man-as-creator, the concept of continuous and ever accelerating growth which invariably improves the conditions of human existence, resulted in posing new questions and in the development of a moral (including social and political) philosophy. The "Brechtian vision" of Galileo's agony led through the whole range of moral and social philosophies to Hiroshima and Vietnam. "Scientists, who imagined they reigned supreme, began to be confronted with their providers, comptrollers and patrons -- the modern State. Science for the discovery of means to surviving began to look, also, like science for the manufacturing of means to dominate, oppress and suppress" (p. 29).

There is a certain contradiction in Abdel-Malek's views. On the one hand, Brechtian Galileo, a generalized representative of the system of values adopted in the scientific community, embraces objectivism and political and moral disinvolvement (p. 27). On the other hand, Galileo imagines himself a supreme ruler, which seems far-fetched. But precisely that tragic situation which Brecht described has become the subject of research in the field of the history of

science. In particular, Wolfgang Van Den Daele, a West German sociologist of science, who studied the making of science as a social institution in the new times, shows that in this process science separated from politics, morals, religion and reform movement. This separation was dictated, he holds, not only by scientific goals proper but also by social phenomena, in particular, by absolutist government under which science was institutionalized. As a result, science tended to become ethically neutral. This, however, is not the sole possible trend, according to Van Den Daele. It is not accidental, he writes, that at this time of the ecological crisis, the danger of a nuclear disaster, and development of genetic engineering, the trend towards neutrality provokes social protest; the public insists that the moral component be included in the sphere of scientific thinking.[15] In our view, the moral component has always been there although not usually explicitly expressed. Therefore, what is required is to show this component in forms suitable for our times rather than to borrow it from outside.

The lack of objectivity and historical concrete approach becomes especially obvious when Abdel-Malek describes the traditions of great Oriental civilizations which allegedly viewed man in society and his activities of a scientist, moral philosopher and citizen as an entity integrated into the national cultural structure which, in turn, is integrated into the totality of civilizations. But the history of many countries of the East knew despotism, tyranny, complete suppression of the personality by the state and religious fanaticism.

Today, continues Abdel-Malek, the Western form of development is undergoing a deep crisis and its hegemony is triggering a protest from the developing countries. But the political leaders and statesmen of the West fail to admit that this is a crisis of the industrial or "postindustrial" society, a form of civilization, rather than of civilization generally. The advanced capitalist countries of the West tend to consume an increasing amount of raw materials and energy for the sake of increasing their wealth.

The Western concept of the development of civilization must be radically revised, argues Abdel-Malek. This revision is already underway. The goals of today's Western civilization, in particular the capitalist goals, are being fundamentally reappraised. The Western view of the East also needs reassessment. Thus, the Arabs have been associated only with their conquests whereas the importance of the Islamic civilization for the development of the West has been underestimated. The mounting interest in the East is attributable more to the national and social revolutions aimed at its revival than to the efforts of scientists.

The criticism levelled by the Egyptian scientist at the bourgeois civilization which makes a detrimental impact on man and his existence, notably in the developing world, seems justified. On the other hand, the idealization of the Oriental culture and values and the rejection of the scientific, technological and cultural achievements of other regions make it impossible for Abdel-Malek to propose any realistic and specific ways to solve the problems. His "natural intellectual" is more of a Utopia than a visible trend.

A. Ahmad of India viewed the ethics of science through the optics of his own interpretation of universalism. He stated that the basic issue of today is that of war and peace and the closely related problems of man's emancipation and survival. In

his view, man has to be seen in a new, universal light if these problems are to be solved.

Man's behaviour is dictated by the human identities that take shape in culture and are maintained by social structures. Thus, the economic and political models of man note only his quest for maximal satisfaction of his own needs in the competitive world. The social, political, religious and other institutions are built along the same lines. This results in human alienation and, consequently, in exploitation of man by man, violence and wars; besides, man is alienated from nature which is therefore ravaged and in this way man's environment is destroyed.

As a counter-balance, Ahmad proposed developing concepts of a universal community and universal man and their behavioural, structural and cultural characteristics. None of the great religious or ideological movements, Ahmad believes, has succeeded in developing and propagating the spirit of universalism. In his view, the ethics of science could do this. But why and how can an objective and supposedly value-free system of thinking and action be related with another one, which is purely philosophical and value-oriented? To answer this question, the author compares the values of universalism with those underlying scientific research. Science, apart from certain historical exceptions, is universal in its intellectual and social guidelines. This is evidenced by the discovery of the general laws of nature and interrelationship of phenomena, or unity in diversity which science seeks regardless of diverse subcultural constraints imposed on man's world view. This quality manifests itself, in particular, as impartiality in science. For the sake of objectivity, Ahmad notes, the scientist remains impartial and ethically neutral in respect to the phenomena he examines; however, he is and must become, in a way, part of these phenomena to evaluate and fully understand them. "Objectivity in science is not a value for itself; neither are detachment and ethical neutrality. They are fundamental to science because they contribute toward the highest value: to internalize, appreciate, and understand nature in order to seek hidden unities in apparent diversity."[16]

How can science facilitate the realization of universal ideals? Ahmad believes that to be able to do so, science must

be freed from serving the technology which perpetuates exploitation and from the dehumanizing impact of technocracy; in addition, science must develop relying on fundamental values, such as spatial continuity, unity in diversity, objectivity, and humanism. It is in this context that the ethics of science and the spirit of universalism would be intertwined. If this goal is to be achieved, the objectives and values that scientists attribute to science (and to themselves), have to be critically analyzed and revised.

Ahmad is hardly right in arguing that some limited theoretical models of man are sources of alienation, exploitation, and violence. Besides, he is in conflict with himself, for the universality of science which he emphasizes is by no means consistent with the fact that science develops theoretical models in which man is confined within narrow group interests. His position may be appreciated when he emphasizes the professional responsibility of scientists who, in the light of the ideological significance of their activities, must defend and consolidate universal humanistic ideals and values. These ideals and values will be shared by entire humanity not as a consequence of appeals and preaching, and only to the extent to which people at large, including the working people of the developing countries, become true protagonists of history and to the extent to which social progress, world peace and national independence become the goal of their social historical practice.

To sum up the various conceptions of the interrelationship between science and ethics, the scientists and thinkers in the developing countries seek their own specific ways to solve this problem which takes specific forms because of the special socio-

economic structures and cultures of those countries. Much in their views may and must be critically analyzed; still, their participation in discussions on the ethical issues of science is an essentially important fact which extends the framework of the discussions, identifies new aspects of the problems and thus broadens the common ground for the search for constructive solutions which would recognize the interests of the developing countries and the need for science to contribute to determining the paths of their socio-economic and cultural development.

In discussing the ethical problems of science the latter must not be treated as a mere sum total of knowledge in isolation from the purposeful activity of people who create and utilize this knowledge. The argument that science is ethically neutral originated precisely from this understanding of science. But if science is treated as a cognitive and also a socially organized activity, a broad spectrum of its ethical characteristics may be revealed. Scientific work is still viewed, as a rule, as research aimed at the acquisition of new knowledge. We have also accentuated this view. True, this is a basic feature of scientific activity. But the work of a scientist, especially today, is not research alone; he is also engaged in teaching; search for information essential for stating the research problem and discussion of the methods to solve it; popularization of scientific achievements; management, notably of research and development; editing and reviewing; consultations and expert advice. This broad range naturally stems from both the diversity of interrelated social functions of science and its evolution and in-

creasingly complicated relations inside the scientific community.

The diversity of forms and kinds of scientific activities which have not been analyzed until recent years by the science of science, the sociology or the history of science, has also expanded the scope of the problems taken up by the ethics of science. In particular, G. Skirbekk of Norway spoke in no uncertain terms, at the 22nd Pugwash Symposium, of the social responsibility of the scientist acting as an expert in the making of important political decisions.

In analyzing the relations between science and ethics, Skirbekk views science from different angles. Logically, "science is an activity by which true propositions are separated from false ones. As a truth-seeking activity, science is regulated by norms: 'seek the truth', 'avoid nonsense', 'express yourself clearly', 'seek interesting hypotheses', 'try to test your hypotheses as intensively as possible', to indicate just some formulations of such internal norms for science... Ethics in this sense is presupposed in science, and ... the relation between science and ethics is not merely a question of good or bad uses of scientific results."[17] In turn, to act ethically, one has to know the actual situation. This knowledge is to a certain extent provided by science. When ethics is not confined to abstract standards and values but regarded in the context of actual situation, its relation to science becomes obvious.

Sociologically, scientific activity has its motivations and needs legitimization as in the case of a scientist or a team of scientists who either seek funds for or an authorization of their project. They may refer to the social utility of the project, the military needs, educational merits or the search for the truth as such. Besides, every scientific discipline, every research project have to be legitimatized with regard to other disciplines and projects. These factors are exogenous with respect to the truth-seeking function of the scientific activity.

Historically, the separation of ethics from science and of the means from the ends and integration of the scientific activities into the technological and industrial society, is the product of social development in the context of capitalist economy. Thus, Skirbekk notes, the relations of science and ethics "is a socio-historical phenomenon. And in order to illuminate the responsibilities of scientists today, we have to get an adequate view of what science is in our society, which presupposes a theory of this society."[18] He emphasizes that all today's societies are highly rationalized and science-driven, and science becomes increasingly integrated with the planning and management processes, with the sphere of state and business. As a socially integrated activity, science functions as *expertise*.

Technological expertise of, for example, engineers, nuclear physicists, social scientists, planning specialists, identifies the means to be chosen when the problem has been defined and the goals are specified. Thus the engineer may advise on the bridge construction techniques when a decision on building a bridge in a certain place has been made. However, he is not prepared to discuss other possible goals or the relation of this project to other spheres. Technological expertise is supposed, Skirbekk goes on, to be politically neutral. The experts say what is and people through various institutions decide what must be. This is precisely the way the relation between expertise and politics, ethics and science is usually understood, although this view is no longer universally accepted.

Skirbekk gives numerous arguments against the concept of political neutrality of technological expertise. Every form of expertise, every science provides essentially a true picture of just one aspect of the issue. Correct understanding of the entire situation is possible only if all the relevant viewpoints are recognized. But how science or expertise can decide who may be regarded as an expert in each specific case and what the relation between different aspects of various kinds of expertise must be? In this sense, technological expertise is not politically neutral. Since not every relevant aspect of the situation is represented, the political decisions are biased and the expertise itself is merely half-rational. Such issues are interesting, Skirbekk argues, not only theoretically. Different kinds

of expertise may benefit or harm certain groups. Besides, differences emerge between representatives of scientific disciplines over who is entitled to be an expert in a given field. Thus, psychologists try to prove to the statesmen and the public the growing need for their expertise arguing that insanity is becoming a widespread problem.

Incomplete expertise may cause serious theoretical and practical problems; in numerous cases, however, the incompleteness is obvious. For instance, economic planning cannot do without some sort of ecological expertise. Nutritional problems cannot obviously be solved by "green revolutions" alone without the expertise of social anthropologists and sociologists who would detect undesirable side-effects. In such cases, additional expertise would remedy the incompleteness of the existing expertise.

Additional expertise would also take account of the interests of various, including politically relatively weak, social groups. In this case, it would act as a counter-expertise revealing the interests of these groups and the problems facing them either to give them a deeper insight into these problems or to extend the system of legal aid in cases when a group or an individual is threatened by the consequences of official planning. Skirbekk makes it plain that counter-expertise is essentially an expertise, or a scientific activity which provides information on some actual aspect of the situation. He takes up professional ethical problems facing the experts and calls for such expertise in the framework of the education system and for setting up appropriate social mechanisms.

Technological expertise in itself, even in extended forms, is insufficient, Skirbekk believes. What is also needed is hermeneutic, or interpretative, activity characteristic of the humanities and philosophical disciplines. This does not provide utilizable knowledge; its results are a better understanding and rational generation of those premises which guide the activities of the user of knowledge.

Skirbekk obviously poses serious questions. True, his reasoning on comprehensive expertise is no revelation for students of materialistic dialec-

tics, in particular for those who know of Lenin's premise on the comprehensive study of the object of investigation.

Marxists respect the position of progressively-thinking scientists in the West whose research is aimed at determining the real situation of the working people and helps them in formulating specific tasks of political struggle.

Now that the bourgeoisie is increasingly making use of scientific discoveries to enlarge profits, to exert pressure on the socialist and the developing world, the scientists in the West face a serious problem of their responsibility to their nations and to the world scientific community.

This issue was raised at the 22nd Pugwash Symposium by P. de Forest of the USA. He characterized science as a complex social activity carried out in formal or informal teams, and noted that a comprehensive study of science should incorporate, along with logic, ethics that sociologists refer to as "norms of science", or ethical standards regulating the social interaction of scientists. Science, de Forest continued, exists not only in the internal but also in the external social environment and covers, in addition to patterns of interaction between scientists, the orderly relations between scientists and society. He believes that there is an exogenous ethical standard which is referred to as "the social responsibility of scientists" that develops with the professional role played by the scientist in society and in terms of which scientists evaluate their professional behaviour in specific situations.

On the whole, according to de Forest, the hierarchy of ethics in science includes several levels: the application of science's internal ethical standards to professional interactions of scientists; evaluation of the behaviour of scientists in terms of its consistency with universal ethical standards; regarding science as a social institution in the framework of

which scientists are involved in a broad spectrum of external interrelationships.

One of important components in the environment in which science functions is its geopolitical environment which has two dimensions, national and international. Science has not experienced any strong external influence until the early twentieth century. Since then, however, it has been growing in intensity. As a result, now two social systems of science exist: internal, for which progress of science is a self-contained value, and external which is dictated by the geopolitical environment. The fundamental difficulties arising in attempts to define the ethics of science are attributable, according to de Forest, to underestimation of either of these systems. Placing the emphasis on the internal ethics of science leads either to denying the fact that scientific applications are of interest to scientists or to complaints that the end of the autonomy of science is a symptom of the decline of scientific culture. On the other hand, a hasty acceptance of the definition of scientific ends and means in strictly national terms may threaten genuine independence and international nature of scientific research and, in extreme cases, lead to violating moral standards in relation to scientists.

According to de Forest, the concept of international scientific community implies two things. The first stems from the universality of science and concerns the internal factors of scientific practice: everywhere scientists are engaged in the same kind of activity in compliance with the same rules and principles. The other has to do with the relations between science and its environment. Components of the social system of science, such as education, research and communication, cannot be confined within national boundaries. True, interaction between scientists does largely occur within these boundaries; the same is true of the scientists' external contacts, such as the choice of the object of research, implementation of the project and application of the findings. Nevertheless, the universal nature of science maintains its real significance both internally and externally. "Any attempt to create a distinctly 'national' science (as in the Aryan physics of the Nazi era) is violative of the universal character of science,"[19] and poses a serious threat to the freedom of research and social responsibility of scientists.

De Forest identifies several levels on which the loyalty of individual scientists to the international scientific community manifests itself. The highest level is acceptance by all scientists of the internal logic and ethics of science when they follow the scientific method and are guided by scientific standards. A lower level is involvement in certain disciplines, which they share with their colleagues throughout the world who have similar interests and education. The lowermost level, which expresses itself in the everyday life of the scientist, is involvement in international research programmes, projects, congresses, and the like. The advanced and stable forms of this interaction are "international invisible colleges" existing in numerous scientific disciplines.

The scientist's involvement in the international scientific community, on the one hand, and in the national geopolitical environment, on the other, may result in a conflict such as the "brain drain", defence research, exploration of energy problems. Governments strongly affect the external dimension of science by defining not only the field in which scientists must be engaged, but also the specific projects and ways of implementing them. De Forest discusses various strategies of this kind employed in the USA. All of them entail serious ethical problems, conflicts between the role of a scientist and that of a citizen of the state which ever more frequently finances research with a view to applying the findings for narrow national purposes.

Are there ethical standards which could provide guidance for the scientist in this situation? In some cases, the situation is obvious. For example, any internally defined ethics of science should denounce the scientist who departs from the spirit of free research for the sake of vested interests. As for the case of Nazi scientists who not only impinged on the freedom of science but also were involved in the murder of numerous people, including scientists, this kind of behaviour is assessed by ethical standards which are higher than those of scientific research, i.e. by universal and invariable standards which must not be violated by any scientist anywhere and under any circumstances.

When these universal standards are in conflict with nationally defined standards, de Forest believes, an international

code of scientific ethics must be available which would specify in detail the intolerable patterns of scientific behaviour. At present, such a code exists in a rudimentary form, which follows from the differences among scientists on atomic weaponry and genetic experimentation. Issues in social responsibility directly face scientists who are personally involved in some controversial area. As the area or the attitude of the scientist change, so does the situation itself and, consequently, its assessment in terms of ethics.

As for the social responsibility of scientists on the international, global level, which has become today a highly controversial issue, de Forest notes: "Global public interest of science follows from the recognition that the scientist is responsible to the whole of mankind, not just individually for the actions he takes as a scientist, but collectively for the applications which are made of the products of science in every nation and throughout the world."[20]

De Forest discusses the relation between science and ethics in practical terms; he shows that there is more to the social responsibility of scientists than an abstract appeal; it is also an actual, although not necessarily an effective, factor. On the other hand, he unjustifiably opposes the social responsibility of scientists to their own country and to the world scientific community irrespective of the difference between the opposite social systems. Under socialism, where the development of science is an organic part of social development, there is no ground for conflicts between the patriotism of scientists and their loyalty to humanitarian values and norms of world science. Marxist philosophers view international cooperation of scientists, in particular, of scientists from countries having different socio-economic systems, not only as a natural aspect in the life of science but also as a prerequisite for sol-

ving global problems affecting both individual countries and the whole of mankind. Under capitalism, a difference must be made (but de Forest ignores it) between the responsibility of the scientist to the nation and to the ruling circles which do not necessarily express the true interests of the nation.

The above review of discussions on the problems of science and ethics, taking place in individual countries and at international meetings, leads to a number of conclusions. First of all, it is evident that the very statement of the question on the relation between science and ethics depends to a decisive degree on what is understood by *science*. This understanding also dictates the degree to which the ethical standards are "binding" on the scientist. Indeed, if scientific cognition is understood as a mere detection or comprehension of truths, then the ethical criteria have but a minimal bearing on it. If, however, cognition is understood as social human activity, social in terms of its premises, environment, results and consequences, then the ethical standards are applicable to science. This was precisely the reason why many participants in the discussions tried and defined the very concept of science. In this respect, therefore, the relationship of science and ethics is closely associated with the problems studied by the science of science, the methodology and theory of science.

Furthermore, the discussions revealed that the self-awareness of scientists undergoes significant changes attributable to a broader interpretation of the social responsibility of science. On the one hand, science becomes responsible not only for the

consequences of scientific applications, for its "after-effects", but also for the *process of research*, for its internal world, for the object of search or for refusal to take up certain topics, for the staging and conduct of experiments. On the other hand, the very concept of the *subject of responsibility* is changing. It is no longer science viewed as an entity and thus as an abstraction but scientific disciplines, areas of research, research teams and, in the final analysis, individual researchers.

Another conclusion is that in discussing the relation between science and ethics a *concrete historical approach* is all-important so as to regard science, rather than generally as all good or all evil, at a specific stage of its development with due account of its potential at that stage and its diverse effects on man and society. This approach also calls for the recognition of the specific socio-economic and cultural context in which the social institution of science exists. Otherwise, any plans of ethical control of science would remain utopian, at best, or may lead to undesirable consequences, the worst of which would be the incapacitation of any scientific activity by excessive regulation. Some of the conceptions we have discussed do not adequately apply this approach, if at all.

A final and a most obvious conclusion is that, at present, the issue of science and ethics offers incomparably more outstanding questions and problems, some of which have not yet been properly formulated, than ready-made answers and solutions. Nevertheless, the discussions are strong incentives for the development of the ethico-humanistic self-

awareness of scientists, the social responsibility of science to humanity. The most important conclusion from these discussions is that on the *unity of scientific research and humanistic ideals*, established as the principle and guideline of true science as a specific social institution at the service of man and his free and all-round development. This unity also implies the unity of the social goals of scientific cognition and the ethical values of humanity which stem from a single root – the good of man. This unity of scientific research and humanistic ideals, of the social goals of cognition and the ethical values of humanity, exists only as the principle and goal of true science. In real life, however, science is very far from this ideal.

Still, we have to bear in mind that an organic unity of science and humanism, the establishment of science as a force at the service of progress, is a vital objective of humanity's development today. There is no other way either for science or humanity. This awareness makes it possible to obtain a better ethical insight into a research project and its results and thus overcome the dangerous ethical relativism and nihilism, i.e. promotion of the "inevitability" of cognition as the allegedly supreme criterion of its human essence and the self-contained source of ethical values for science.

Imposition of the absolute value of scientific cognition as the sole source of truth and scientistic over-optimism the extreme manifestation of which is the notion of a universal Reason (Laplace), are known to dismiss the need for an outside – social and ethical – evaluation of knowledge. Consequently, any

specific ethics for science was out of the question. Ethical evaluation of scientific knowledge was thus something pointless and unnecessary, and Socratian problem of coincidence of true wisdom (knowledge) and true goodness (morals) was seen as a kind of paradox. Kant's attempts to reject the claims of scientism, reveal the limits of theoretical thinking and the need of supplementing it with moral principles, i.e. with a categorical imperative, which is independent of theoretical thinking and exists for the good of mankind, seemed abstract moralizing, an attempt to see a problem where it does not essentially exist, at least in such acute forms.

The collapse of these illusions, which was only accelerated by the dropping of A-bombs on Hiroshima and Nagasaki, resulted in thousands of personal tragedies and made numerous scientists aware of the new social and moral situation. It is obvious now that science cannot develop in a "social vacuum" and in isolation from its conceptual, socio-philosophic, and ethical fundamentals. Moral, ethical problems pervade the very fabric of science, far from being something exogenous for it. Extreme scientism is losing an increasing number of followers and is proving to be bankrupt. The understanding is growing of the undeniable fact that unless the social responsibility of scientists and the importance of the moral, ethical trend in science grow at the rate of a geometrical progression, humanity and science itself will not be able to develop even at the rate of an arithmetic progression.

At its Eighteenth Session, the General Conference of UNESCO held in Paris in 1974 adopted

"Recommendation on the Status of Scientific Researchers".[21] The list of the most important ethical and civil principles to guide researchers in any country includes the intellectual freedom to look for, express, and defend the scientific truth as they see it; participation in the definition of the goals and directions of programmes which they carry out and the methods which must be adopted for humanitarian, social or ecological considerations; freedom of self-expression on humanistic, social and ecological aspects of certain projects and of withdrawal from them if their consequences compel them to do so; the duty to contribute to the development of science, culture and education in their own countries being guided not only by the need to solve national problems but also by the international ideals of the UN.

The growing self-awareness of scientists is expressed in different ways. The Pugwash movement which began with the famous Russell-Einstein Manifesto, is a consistent expression of this. The 1978 Pugwash Symposium held in Varna, Bulgaria, re-emphasized the special responsibility of scientists attributable to their knowledge, technical skills and international links. In their countries they must disseminate truthful information on the consequences of using advanced weapons; the consequences of industrial development, urbanization, development of agriculture and social structures; and the availability of resources for future development of mankind. The activities of scientists in close contact with statesmen are essential for the elimination of misunderstandings, ignorance

and hatred and, consequently, for the preservation of world peace.

This by no means implies that scientism and socio-ethical nihilism have lost all ground. On the contrary, in numerous cases their influence becomes even stronger but under another guise, in attempts to create an ethics of science based on objective postulates of cognition taken out of the context of social practice and universal ethical values. Long ago, Blaise Pascal said: "Let us strive then to think well – therein is the principle of morality."[22] This position which makes scientific cognition the source of ethics is reflected in Jacques Monod's book mentioned earlier. The absolute value attached to scientific cognition and its ethics is, however, in open conflict with reality and can rather misguide scientists, in particular socially and ethically, than provide a reliable moral support. Serving the good of man as the essential property of science, which increasingly manifests itself in its functioning, does not exist today in its pure form and in some cases it is only a derivative of the social factors. This does not deny the ethics of scientific cognition, or the standards which guide science in its quest for truth and the principles of the scientist's professional behaviour, in particular in experimentation on man. What is implied is the limited potential of the scientistic treatment of knowledge, the fallacy and danger of turning knowledge into an ultimate and absolute value above all others, including ethical values. Such ideas might only give rise to romantically Utopian illusions which, as has repeatedly been the case in recent decades, fall apart as soon as they come into

conflict with reality and sometimes turn into their opposite by serving forces hostile to man and his future because such illusions are defenceless in the face of these forces.

The ethics of cognition cannot therefore be the sole guideline for the scientist in the land of the Unknown, it cannot by itself keep science on its humanistic course. Consequently, the ethics of science cannot act as the ethical code in the broad sense because it itself is dependent on the socio-economic, political, ideological, and, finally, ethical, or moral, factors and values which vary with the historical conditions and determine the development of science as a social institution. The ethics of cognition cannot be a self-contained or, even less so, the utmost value, measure or guarantor of all other values also because the objective truth itself obtained through scientific cognition is relative and specific, its highest criterion being the human praxis, in particular socio-historical and production activities. Aprioristic identification of truth and good, truth and humanism are unjustified and abstract. Our views of good and evil, of humanism are in every case dictated by the specific historical conditions and the social and class factors, the social relations which prevail in the current period in history.

Consequently, the diverse and complex problems facing science today, notably ethical issues, cannot be solved within the framework of the logic and ethics of cognition itself. They should be viewed in a broader context of the social goals of cognition, humanistic ideals and the ethical values of society

as an entity. This approach alone can provide a clue to the solution which would be consistent with the needs of social progress, the good of mankind and the objectives of science itself. The objectives of science are infinite and it would be equivalent to obscurantism to believe that there are problems related, for instance, to man that cannot be investigated by science; this is not, however, an approval of scientistic-technocratic manipulation of man which disregards the relative stability and uniqueness of his structure; many issues of this kind may be simply premature for science because it is unprepared for their in-depth study, and for political, moral, ethical and humanistic reasons. On the other hand, science is not of paramount importance for the development of man, nor is it the sole sphere for the realization of his essential powers, and so does not exhaust all problems of humanism as an ideology and practice of science. Marx noted that "the *development of science*, this notional and at the same time practical form of wealth, is only one aspect, one form, in which the *development of human production powers*, i.e. of wealth, appears".[23] All other kinds of creative activity both in the intellectual and material spheres eliminate this one-sided aspect of science and fill the humanistic ideal with multifarious content, which is generally characteristic of accomplished man.

This fact outlines the sphere in which the ethics of cognition is socially significant. Scientific activity has a strong impact on the moral behaviour of people, on morals and ethics as a whole, but not as an absolute or self-contained phenomenon; it is

guided by a general humanitarian objective of serving the free all-round development of man. One cannot but endorse the view of Albert Schweitzer, the German-French thinker, that ethics is one's infinite responsibility for everything that lives; the ethics of adoration of life (above all, human life) attaches great importance to increasing the human sense of responsibility. "The ideal [of a cultured man]... manifests itself as a cultural ideal and implies maintenance of culture under any circumstances".[24] His view is especially important when we turn to specific socio-ethical problems of science – be it physics, biology or human genetics, to the ethical aspects of the issues which the scientific and technological revolution brings to the fore.

NOTES

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[16]*Encyclopaedia moderna*, 1975, Godina X, 30/1 pp. 32-33.

[17]Ibid., p. 34.

[18]Ibid., p. 31.

[19]Ibid., p. 46.

[20]Ibid., p. 53.

[21]*UNESCO. Records of the General Conference. Eighteenth Session. Paris, 17 October to 23 November 1974*, Vol. I, Resolutions, UNESCO, Paris, 1975, pp. 169-79.

[22]Quoted in: Joseph Fletcher, *The Ethics of Genetic Control, Ending Reproductive Roulette,* Anchor Press/Doubleday, Garden City, N.Y., 1974, p. 37.

[23]Karl Marx, "Economic Manuscripts of 1857-58", in: Karl Marx, Frederick Engels, *Collected Works*, Vol. 28, p. 464.

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CHAPTER 4

Physical Problems and Moral Dilemmas: On the Brink of Nuclear Disaster? Science and the Global Problems of Human Civilization Today and Tomorrow: New Thinking and New (Real) Humanism

Nuclear physicists were the first scientists to face the problems of their social function and responsibility to society. In August 1945, US planes dropped A-bombs on Hiroshima and Nagasaki. Their blasts killed hundreds of thousands men, women and children and the list of victims is still open. The various short- and longer-term political implications of the bombings have been fully reported. We will take them up to the extent to which science and scientists were involved and to which they influenced the self-awareness of scientists. In this context let us recall a few events from the recent past.

The 1930s saw striking discoveries in the physics of the atom. The scientific knowledge of the structure of the atom was expanding at an unprecedented pace. According to J. Robert Oppenheimer, a US physicist and a participant in the events, progress in that field became especially rapid "when armed with quantum theory and *eager to understand*, physicists turned their attention not to the behaviour of the atomic electrons around the nucleus, but to the nu-

cleus itself".[1] We have italicized words which illustrate both the atmosphere of research and the motivation of the scientists. Purely cognitive interests remained prevalent for a long time: the researchers "found their way" in the microworld, once entirely unknown to them, and steadily discovered its unusual, occasionally unthinkable in terms of everyday views, specifics as they moved deeper into the matter.

As the for possible application of these discoveries, most researchers thought that such issues were improper, to say the least. Recalling his days in Cambridge in the 1920s C.P. Snow wrote, "We prided ourselves that the science we were doing could not, in any conceivable circumstances, have any practical use. The more firmly one could make that claim, the more superior one felt."[2]

Ernest Rutherford, as quoted by Victor F. Weisskopf, also made this view plain: "In early days, prying into the problems of nuclear structure was considered a purely academic, esoteric activity, directed only at the advancement of knowledge about the innermost structure of matter. Rutherford said in 1933, 'Anyone who expects a source of power from transformation of these atoms is talking moonshine.' This conclusion was based on the same reasoning: The nuclear phenomena are too far removed from our human environment."[3] What is more, even in 1936 when practical use of the atomic energy did not seem unthinkable to the physicists any more, Niels Bohr, who was speaking on the possibility of an explosion of an atomic nucleus as a result of its collision with a neutron, wrote that such

effects could hardly advance physicists towards the solution of the problem of practical uses of nuclear energy, so frequently discussed. Unfortunately, the more they knew of nuclear reactions, the more remote this goal seemed.

True, voices were also heard which warned of possible dangers. In particular, Frederick Soddy, a collaborator of Rutherford, said as far back as 1915: "Let us suppose that it became possible to extract the energy, which now oozes out, so to speak, from radioactive materials over a period of thousands of years, in as short a time as we pleased. From a pound weight of such substances one would get about as much energy as would be obtained by burning 150 tons of coal... Yet it is a discovery that conceivably might be made tomorrow, in time for its development and perfection for the use or destruction, let us say, of the next generation, and which, it is pretty certain, will be made by science sooner or later. Surely it will not need this last actual demonstration to convince the world that it is doomed, if it fools with the achievements of science as it has fooled too long in the past...

"War, unless in the meantime man had found a better use for the gifts of science, would not be the lingering agony it is today. Any selected section of the world, or the whole of it if necessary, could be depopulated with a swiftness and dispatch that would leave nothing to be desired."[4] Who knows, it could have been this warning in particular Rutherford had in mind. In any case, Robert A. Millikan, a US physicist, spoke in 1930 about Soddy's misgivings as a myth and bogies crowding in upon ignorant minds.

By the late 1930s, the situation changed radically and quickly. The events earlier in the decade, such as the discovery of the neutron, an elementary particle present in the atomic nucleus, and the construction of the first accelerators, made it possible to observe the behaviour of the nucleus bombarded with charged particles. Finally, in 1938, the fission of the uranium atom, with the release of a considerable amount of energy, was discovered. Now the scientists, and initially they alone, knew that the energy stored in the atomic nuclei could be released through their splitting. Practical applications of nuclear transformations appeared on the agenda.

The discovery of the instability in the world of atoms occurred in one of the most unstable periods in human history, for the Nazi started a world war in 1939. The chauvinistic and misanthropic ideology and policies of Nazism and fascism compelled numerous scientists to flee Germany and Italy; furthermore, because of this, most scientists strongly disliked fascism in which they justly saw a threat to the very existence of mankind as well as to scientific values. As P.H. de Forest noted,[5] this trend was largely enhanced by the international group of scientists who assembled in Niels Bohr's Copenhagen Institute in the 1930s. Initially, they discussed only physics, philosophy, arts and literature and, practically never, politics. Their political awareness developed with the Nazis' growing threat to science, when the quantum theory and the theory of relativity were banned and numerous German physicists were arrested or banished for racist or ideological reasons.

All this resulted in closer international links between physicists and culminated in the formation of a scientific community which was fully aware of the political threat to science and whose members shared a broad area of agreement on the political responsibility of scientists. The international scientific community, de Forest continues, was in fact mobilized against the Nazis even before the war; the contribution of physicists, some of them once German patriots, to radar and nuclear research bears this out.

One of them, Leo Szillard, who had emigrated to the USA, was at the head of a group of nuclear physicists who called on their colleagues throughout the world to desist from publishing their findings which might be abused by the Nazi regime to increase its power. This appeal was not heeded at the time. Some time later, Leo Szillard, Eugene Paul Wigner and Edward Teller approached Albert Einstein and suggested writing a letter to President Roosevelt on the feasibility of nuclear explosives and stating that research along these lines was underway in Germany. Einstein sent the letter in August 1939. In the early 1940s, the letter was followed up with the Manhattan Project, the development of an atomic bomb by a laboratory headed by Robert Oppenheimer in Los Alamos. The new weapon was tested on July 16, 1945. The military and political leaders, as well as scientists, saw for themselves the immense destructive potential of atomic weaponry.

By that time, the world strategic military situation had dramatically changed. German Nazism had been defeated, fortunately before it had nuclear weapons. Peace had come to Europe; the hostilities continued

only in the Far East where the war with Japan was nearing its end. For some time, the USA was the sole country possessing an atomic bomb. In April 1945 Einstein, again on Szillard's instigation, called on the US President not to use the atomic weapon in the war.* The generals and political leaders were not, however, inclined to follow the scientists' advice and the bombs were dropped on Japanese cities. In effect, the political and scientific activity of a big group of scientists who were driven by the most humanistic considerations, culminated in a wantonly anti-humane deed. The best achievements of scientific thought were turned against humanity and the very existence of civilization came under threat.

The scientists responded to the A-bombing of Hiroshima and Nagasaki in different ways. Some, like Edward Teller, voiced their unwarranted support; others, like Robert Oppenheimer, initially approved the bombing but later repented. Many scientists protested. A strong team of Soviet scientists under Igor Kurchatov did their best to break the US monopoly of nuclear weaponry. This team, set up in late 1945, succeeded as early as 1949.

Numerous nuclear scientists in the West were shocked by Hiroshima and Nagasaki. They strongly felt their guilt. In his book *The Part and the Whole*,

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* A group of Los Alamos scientists suggested that final tests be followed by a public demonstration of the nuclear weapon for observers from allied and neutral countries; then scientists would report their discovery and its essence. As the next step the enemy would be invited to capitulation. If this proposal were rejected, the site and hour of forthcoming bombing would be announced to enable evacuation of people and animals.

Werner Heisenberg describes the reaction of Otto Hahn who had discovered, together with F. Strassmann back in 1938, uranium fission. By August 1945 Hahn, Heisenberg and some other German scientists had been taken prisoners-of-war by the British. They could not have contributed directly to the development of the atomic bomb in the USA or, even less so, influence US leaders. Still, when he learned of the bombing of Hiroshima, Heisenberg thought that the endeavours of nuclear physics which had been his life for 25 years, culminated in the death of over 100,000 people. "Otto Hahn felt the deepest shock. Uranium fission had been his most significant scientific discovery and had become the decisive step in atomic technology, which nobody could predict. And that step made possible a horrifying end of an entire city and its population, unarmed people, most of whom did not feel any guilt for the war. Shaken and shattered, Hahn retired to his room and we were seriously worried that he might do something to himself."[6]

These events were not a routine episode in the social history of science, i.e. the development of science as a social institution. They left a deep and largely irremovable imprint on that history, which is worthy of special discussion. Let us recall the problems that we have discussed in Chapter 2. Current investigations in the sociology and history of science reveal that its treatment as neutral in terms of values and, more particularly, ethics, is to a significant degree the product of its evolution in a specific socio-historical context and the process of professionalization of science. US sociologists Talcott Parsons and

Norman W. Storer, speaking of the formation of the scientific profession, note that a major characteristic of scientific activity as a profession, i.e. "having an adequate exchange-relationship with lay society so that, at minimum, men may make a living following a full-time career in the profession – has been largely a development of the last hundred years and seems now to be firmly established."[7]

Loren R. Graham, a US historian of science, put it this way: "In the nineteenth century, amateurs and dilettantes in science gradually lost out to the salaried professionals, and in the process the tone of scientific writing changed. Before the nineteenth century, the journals of learned societies often included speculative articles in which normative and factual questions were intermingled. By the end of the century, such writing was all but absent from the prestigious professional journals. Membership in the societies became increasingly restrictive, often requiring higher education and the concomitant introduction into the ethos of research. A mark of a serious professional scientist was a sober and factual tone."[8]

The professionalization and the ensuing specialization of scientific activity made two kinds of impact on the value orientations of scientists. On the one hand, professional scientists in their fields tend to be close supervisors by drastically opposing the very possibility of voicing incompetent, amateurish views; on the other hand, they generally are reluctant to speak on issues beyond their fields (which tend to shrink in the context of growing specialization). The amateur feels entitled to speak with equal

confidence on a fairly broad range of issues whereas the professional in his own eyes and in the eyes of other people, the general public as well as his colleagues, feels competent only in a certain sphere where his knowledge and skill are paid for. Professionalization encourages distinct separation between standard-setting value judgements and the actual "value-free" reasoning. Only the latter is regarded as becoming to the professional scientist who is viewed as the supplier of the wherewithal, objective scientific knowledge, for the purposes which are chosen by those who provide his livelihood in exchange. This position was aptly expressed by Max Weber in his lecture "*Wissenschaft als Beruf*" (Science as Profession).*

Here professionalization is linked to a specific definition of the social role and, consequently, of the social responsibility of the scientist who acts as the supplier of specialized knowledge and is only responsible for its authenticity and reliability. The normative neutrality of science as a concomitant of its professionalization was a concept most widely spread among the Western scientists in the 1930s and 1940s when it was believed by many to express the true essence of science. This was a major argument in the

* "Science today as a *professionally* pursued occupation is at the service of self-consciousness and cognition of actual interrelationships rather than a gracious gift or revelation from visionaries and prophets or a component in the meditations of wizards and philosophers on the *essence of the world* – it is a fact of our historical situation from which we, as long as we remain ourselves, cannot break away" (Max Weber, *Gesammelte Aufsätze zur Wissenschaftslehre*, J.C.B. Mohr, Tübingen, 1951, p. 593).

arsenal of neopositivism insofar as it developed its own ideas on the nature and content of scientific activities. Stephen Toulmin recalls that this position in extreme forms was expressed by his professors and senior colleagues during his studies in Britain before World War II. These views were buttressed by factual, non-emotional, anti-philosophical, class-bound and role-oriented beliefs shared by British professional groups between the two wars. Their overriding concern was to concentrate on purest, most intellectual and most autonomous aspects of the relationship between science and values, those that are least connected with ethical issues.

Still, however widespread they were, these views were not universally shared. At that same time quite a few scientists had a profound interest in social issues, in particular in the science-society interaction. Some, like John Bernal, viewed socialism as a society which opens up broad vistas for the development of science which is used, in its turn, as a major factor in the society's advancement.

Loren R. Graham indicates another aspect in the scientific professionalism. "Paradoxically, in the early years of the twentieth century, exactly when research scientists were beginning to study the bases of human conduct in a variety of disciplines, the belief that science and values are separate realms became the explicit ethos of science in Western Europe and North America. This development will seem less paradoxical, however, when we see that it was precisely because science was beginning to touch ever more closely on values that scientists found it comfortable to speak of the value-free na-

ture of their research. Many quarrels were avoided that way – or, to be more accurate, the day when the debates would have to be fully faced was postponed."[9] And that day came.

It should be re-emphasized that the narrow functional interpretation of the social role of the scientist as a supplier of specialized knowledge, who is barred from the realm of values, emerges only at a certain stage in the development of science, in a specific socio-historical context. While in a sense this interpretation is an extension and refinement of the scientist's system of values that had emerged before, in other ways, by virtue of its one-sided nature, it enters into an increasingly obvious conflict with that broader system. In the preprofessional science, the scientist felt entitled to speak on a fairly wide range of issues – such was his understanding of his purpose and role in society. In particular, enlightenment was high on his agenda, for he viewed himself as the bearer of true knowledge so necessary for all people of the world and capable of dispelling the dark of ignorance, superstitions and prejudices. He boldly addressed global conceptual problems, although he did this sometimes in haste and departed too far from the available authentic scientific knowledge. Finally, he saw in science a great humanizing force and would have hardly agreed to view knowledge as merely a means to reach some pragmatic goals outside the scope of science. As science was becoming professional at a very fast rate, this system of values moved to the background for some time; still, it has not lost all its adherents.

The divergence between the two points of view, between two systems of values, is thus very serious. The gap became especially wide after the explosions of A-bombs over Hiroshima and Nagasaki which posed very serious moral dilemmas before many Western physicists. The ethos of professional science suggested to them a way to remove the burden of social responsibility and some scientists did just that. However, the critical situation made it plain that in fact the power of normative standards was far from infinite and that the lofty ideals of the "small science" of the past stood their ground in the face of the onslaught of the down-to-earth values of the "great science" of today. On the whole, the scientific community took a socially responsible stand. At that time, the Western scientists who acted responsibly and tried to prevent the use of nuclear weapons against civil population, were defeated, their protests went unheeded and they were unable to prevent the catastrophe. They also failed to prevent the nuclear arms race that followed. But there is more to the events that occurred at that time, for the ethics of professionalized science proved inadequate while the social responsibility issues became an integral component in the existence and development of science. It is in this sense that we spoke of the irreversible impact of these events on the social history of science. True, even today socially irresponsible behaviour of scientists which seeks vindication in the ethics of professional science, is no rare occasion. What is important, however, is that this position is not regarded as a natural and the sole possible one

for the scientist but as something which needs defence and justification.

We do not call for giving up the professional ethics of the scientist, for its emergence and evolution are irreversible. We wish only to emphasize that at a certain stage in the development of science this set of standards was understood too narrowly, disregarding the issues of social responsibility. In point of fact, however, the professional ethics and the ethics of social responsibility must not necessarily come into conflict. The broadly understood professional ethics incorporate the scientist's responsibility to the society. In its turn, social responsibility, if it is not backed by professional competence, cannot be anything but ephemeral or bordering on demagoguery which manifested itself in the leftist trends against science in the West in the 1960s.

The problem of the professional interests of the scientist versus his social role remains an issue as relevant today as it was in 1945. This problem cannot be resolved once and for all. It re-emerges in a new form with every change in the situation in science and in its interrelationship with society and has to be solved anew again and again. This is made clear in the memoirs of Werner Heisenberg dealing with his debates with Carl Weizsäcker, a German physicist, in August 1945, on essentially the same issue of professional versus social responsibility. Weizsäcker suggested distinguishing discoveries the applications of which were unpredictable and inventions which pursued a certain practical goal. In this interpretation, the discoverer is not responsible for the utility of or a danger posed by the subsequent

development; in filling the order of a large human community rather than acting as an individual, the inventor, unlike the discoverer, has to be confident that the goal is valuable and so he may be held responsible for his invention.

Both scientists recognized in the course of discussion that this classification was deficient. Weizsäcker refuted the argument that was later repeatedly advanced in justification of the A-bombing:* "At the first moment after such catastrophes quite plausible arguments are advanced in abundant quantities. Some say that the use of an A-bomb brought the war to an earlier end. True, the death toll might have been greater, had the war continued without this weapon... These calculations are, however, utterly unsatisfactory, for the long-term political consequences are unknown... I am not buying this argument... I would look at it this way, is not the very choice of the means decisive?"[10]

In the summary of his talk with Weizsäcker in which both of them agreed on the impossibility to get away from social responsibility, Heisenberg noted, "still we understood ... that for an individual whom the scientific or technological progress posed an important problem it is not sufficient to think of

* According to Robert Oppenheimer, the military operations planned at that time would have been much more horrible than A-bombing, "they would have involved, it was thought, a half million or a million casualties on the Allied side and twice that number on the Japanese side" (Robert Oppenheimer, op. cit., p. 61). This arithmetic approach to the lives of hundreds of thousands of innocent people disposed of in a strategic game without their knowledge, is morally very vulnerable.

this problem alone. He has to view the solution as part of the general course of events which he obviously welcomes when he has undertaken to solve this problem. He will arrive at correct decisions easier if he recognizes this general interdependence. This implies, of course, that he must try to be involved in social life, to influence government decisions if he wishes not only to think but also to act in the right way."[11]

This is the position of a scientist who tries to understand the new role science and scientific discoveries play in the life of people and is not inclined to evade the entailing burden of responsibility. One should not overlook Heisenberg's opinion that the scientist has not only to view his professional activity in a broad socio-historical context but also to act vigorously to prevent anti-humane use of his findings.

One of the issues which Weizsäcker and Heisenberg discussed was the extent to which the guilt so acutely felt by Otto Hahn was justified and how guilty really were the scientists whose research had contributed to the development of atomic weaponry. This issue is still raised in discussions on the ethics of science. In particular, in his speech at the round-table discussion on "Science—Technology—Humanism" sponsored in 1981 by the editorial board of *Voprosy istorii yestestvoznaniya i tekhniki* and the Scientific Council on Philosophical and Social Issues in Science and Technology of the USSR Academy of Sciences Presidium, D.S. Danin made some remarks that we wish to challenge. In his view, "the guilt of the scientists" is a mythical, non-existent issue

which could be removed (although it is not clear how an issue can be removed) and researchers have never been guilty, "the guilt must be placed squarely on those who use the research findings in an improper way".[12]

We will take up this latter argument further in the book, an argument which is frequently advanced in debates on the ethical problems of science. Now let us look at another point that Danin made. The issue of guilt, which arose chiefly after the development of nuclear weapons, now "serves the spontaneous, unannounced campaign of hostility towards today's natural sciences – cognition of nature – and it is regrettable that these issues are widely discussed by the young without vindication of science".[13] Danin is thus seen to recognize the existence of the problem. What is more, as he calls for vindication, then guilt may be supposed to exist. But rejecting a discussion just because of possible misinterpretation and diversion is not the best possible solution. This rejection, as long as thinking and speaking on that issue cannot be banned, would leave the anti-scientific hostility unopposed.

In this issue, the "guilt of science" may be distinguished from "the guilt of the scientists". The "guilt of science" can hardly be constructively discussed because the guilty party is everybody (more specifically, some abstract being in terms of human relations) and nobody specifically. This substitution which makes science as a whole guilty is logically fallacious and leads in real life either to fruitless moralizing or to offhand denunciation of science, which Danin opposes.

The sense of guilt on the part of Western scientists is in numerous cases a normal human response to some negative consequences of the technological progress, a natural way in which scientists become aware of their responsibility before mankind. The wife of Enrico Fermi recalled that following the nuclear bombing of the Japanese cities, "among the scientists in Los Alamos the sense of guilt may have been felt more or less deeply, more or less consciously. It was there undeniably."[14] The guilt acutely felt by numerous scientists in the West after the tragedy of Hiroshima and Nagasaki, is a fact of the social history of science, a fact which brought about significant changes both in science itself and in its relationships with society.

The sense of guilt may play a highly constructive role. In the case we discuss it became a serious lesson which showed that scientific activity can decide to an increasing extent not only the well-being but also the very existence of humanity. The shock that progressively-minded scientists felt compelled them to understand in an exceedingly painful way their responsibility to humanity. Now they directly address public opinion as well as statesmen.

As early as August 1945, Niels Bohr wrote in his article "A Challenge to Civilization": "The advance of physical science which has made it possible to release vast amounts of energy through atomic disintegration has initiated a veritable revolution of human resources, presenting civilization with a most serious challenge. The formidable means of destruction which have come within reach of man will obviously constitute a mortal menace to civilization un-

less, in due time, universal agreement can be obtained about appropriate measures to prevent any unwarranted use of the new energy sources."[15] De Forest emphasized: "For Niels Bohr and many of his students and colleagues, Hiroshima, and the nuclear arms race which followed, presented a momentous threat to the survival of humanity, but also a challenge to the international scientific community to fulfil its global responsibility by working to reduce and eliminate the potential for the use of nuclear weapons... The pre-eminent expression of international responsibility in science remains today the movement of scientists for reduction or elimination of nuclear weapons".[16]

In this spirit, de Forest notes, the Society for Social Responsibility in Science was set up in 1949 with a view to promoting a "constructive alternative to militarism". In 1969 the Society called for the complete withdrawal of the US from Vietnam and sent there a team to investigate the use of defoliants. The anti-war nature of the Society dictated its interest in ecological issues. In the 1950s, the Scientists Institute for Public Information (SIPI) was set up which initially addressed itself to problems arising from radioactive fall-out and later took up broader issues in environmental protection. A US historian of science Sheldon Krimsky wrote: "Local SIPI scientists drew attention to the frequency with which unanticipated consequences followed irresponsible tampering with the biosphere. Those cited as irresponsible often turned out to be well-meaning scientists who held a more limited perspective on the impact of their work."[17]

A more radical organization of US scientists, Scientists and Engineers for Social and Political Action (SESPA), was launched by physicists in 1969 and "rapidly progressed from questioning the scientist's moral and social responsibilities to a full-blown critique of American capitalism".[18] One of its actions was the presenting of the Dr. Strangelove Award (after the protagonist of Stanley Kubrick's film, a scientific maniac who would unhesitatingly start a world catastrophe for the sake of his ideas) to Dr. Edward Teller, the "father of the US H-bomb". Later SESPA bitterly criticized research in genetically-conditioned criminal behaviour, in sociobiology, and intelligence evaluation, all of which will be discussed later. Unlike more moderate organizations which concentrate on unpredictable and unintended consequences of the scientific impact on society, radical organizations of this kind oppose the use of science for the consolidation of the existing capitalist economic and social relations and see a manifestation of the scientist's sense of responsibility in the active struggle against the system of these relations.

The resurgent socio-political activity of some scientists did not necessarily take adequate forms. In particular, the idea of a world government was quite a vogue among them. They believed that only that kind of authority could prevent a nuclear war. Although it stemmed from the understanding of the global nature of the nuclear threat, this idea was abstract and utopian, if not reactionary in the context of the US nuclear monopoly. With time, the social activity of scientists took a more realistic and or-

ganized form and bore tangible fruit such as broad participation of nuclear physicists in the peace movement. Thus social responsibility was fused with professional responsibility to make an impact, in particular, on the range of research projects.

To sum up the events that occurred forty years ago and their significance for the social existence of science, the following points must be emphasized.

(1) For the first time in human history these events made it possible to appreciate the power of science, of scientific knowledge and scientific activities as a factor in the destiny and even survival of humanity. This awareness comes to scientists, statesmen and the broad public. The actual power of science is, however, seen in a negative as well as a positive light; for this reason, science is viewed as a mixed blessing not so much in terms of good and evil as in that it leads humanity into situations where the course of action is not determined in advance and so a weighed, calculated and responsible choice must be made.

(2) The rapidly changing and complex social role of science posed the problem of self-determination of scientists in a new situation. Controversy on the responsibility of scientists to society ensued, which varies in intensity but remains an integral part of scientific life. True, for quite a few scientists self-determination lies within the professional framework and so they absolve their responsibility in favour of outside forces. Furthermore, those who do participate in discussions are divided. Some admit the significant role played by science in the life of society but do not think that their social activity may bring any substantial results. Others do not wish to

yield to exogenous circumstances and try to do their utmost to prevent anti-humane utilization of scientific findings.

(3) The active position backed by the authority and dedicated effort of numerous outstanding scientists brings to the fore the positive side of these events in that, on the whole, the scientific community rejected the narrow professional view of the role of the scientist as a mere intellectual tool in the hands of statesmen. The humanistic traditions of science have been preserved but not without struggle. The search for effective methods and organizational forms of scientists' socio-political activity became an issue in its own right. Eventually, numerous prominent physicists joined the vanguard of the general democratic movement for peace and disarmament, for utilizing the scientific findings for the sake of humanism and social progress.

(4) As for the search for ways and forms of social responsibility, Western scientists did not act vigorously before the situation got out of hand. Aware of their social responsibility, the scientists would act most effectively if the issue of the social consequences is raised at the earliest possible stage of research. The implications of research, notably of basic research, are generally thought to be largely unpredictable. This is indeed so, but today active efforts aimed at forecasting the consequences of utilizing scientific results are *socially essential*. Scientists, more than anyone else, are in a position to detect and assess both the promise and social consequences of applications. Because they are knowledgeable and well-informed, scien-

tists bear a special social responsibility. Prediction and assessment of social consequences of scientific findings presume that the scientist possesses a certain knowledge of the social structure and the prospect of its evolution as well as professional competence. Narrow professionalism proves inadequate in this respect also.

Scientists in the socialist countries, notably Soviet scientists, engaged in both fundamental and applied physics, have undoubted advantages. The awareness of the social objectives of their personal professional activities poses for them the issue of social responsibility, of moral and ethical evaluation of their activities in a different light. This is true of the Soviet nuclear physicists in the late 1940s when the Western physicists were painfully aware of their social responsibility for the outcome of their research. Soviet scientists felt a deep moral satisfaction, not the sense of guilt, because their work consolidated the Soviet defence and foiled the aggressive plans of imperialism, which, as has transpired, had specific objectives and deadlines dictated by the US nuclear monopoly.

This does not imply that Soviet scientists did not or do not see any moral problems or dilemmas in this field, contrary to what Western ideologists and moralists say. In particular, Igor Kurchatov's awareness of the social necessity for the USSR to develop nuclear weaponry as a counterbalance to the US monopoly took a great deal of thinking before it grew into a solid conviction in the high moral value of that action which served peace and the security of the Soviet people.

Foreign policy initiatives offered by the USSR and other countries of the socialist community amount to the practical political expression of that sense of social responsibility. "Socialism unconditionally rejects war as a means of settling political and economic contradictions and ideological disputes among states."[19] The Soviet Union is prepared to destroy its nuclear arsenal if all nuclear powers also do so.

The runaway rate of the arms race is evidenced by the fact that military spendings increase in the USA by 12 to 14 per cent annually; in the period from 1985 to 1989 the military budget totalled 2 trillion dollars which is nearly equal to that of 35 post-World War II years. This increase has an impact on the resource allocation to various fields of research and development. According to Harvey Brooks, a US expert in scientific policy, 63 per cent of federal funds earmarked for research and development, are consumed by space exploration and military needs. The Department of Defense accounts for most of the growth in spendings on basic research. "Nearly one-fifth of all PhD physicists in the United States derive some research support from the Department of Defense,"[20] Brooks also mentions the feedback effect whereby the increased military research and development spendings make the existing weapon systems obsolete and stimulate their replacement by the new and more sophisticated ones.

A considerable number of scientists are today engaged in military R&D which accounts for 40 per cent of all R&D costs. Between 1980 and 1985, the military R&D budgets increased by 250 per cent while the total scientific budgets, by 75 per cent.[21]

The SDI projects are very costly and dangerous for mankind. The US military-industrial complex expects to get about $70,000 million of the taxpayers' money in the coming years for these purposes. Experts believe that the total cost of the first echelon of space-based weaponry will total $100,000 million by the year 2000; a deeper echeloned system will cost $500,000 million if not 2.5 times this amount.

The danger to this planet compels the scientists engaged in basic and applied research to think again and again about ways to prevent anti-humane utilization of their findings and, above all, to prevent a world-wide nuclear disaster which would spell the death of humanity. The situation is clear and scientists speak of it in no uncertain terms: a nuclear war would most probably eliminate man as a biological species. For this reason, authoritative warnings made by scientists are so important now. Their growing participation in the movement for peace and disarmament and against nuclear disaster reveals their awareness of their social responsibility and that their socio-ethical, humanistic ideals and principles find increasingly effective expression.

On January 31, 1955, Frédéric Joliot-Curie, the French physicist, a Communist, the then President of the World Federation of Scientific Workers, wrote a letter to Bertrand Russell, a British philosopher and progressive public figure. He emphasized the threat of nuclear disaster and that the scientists should unite for a joint declaration on that matter. Such a statement, he suggested, should be formulated and signed by prominent scientists who might have different philosophical convictions. Russell

agreed and also insisted that the signatories should not have to belong to one political school of thought but represent the opinions of all strata of society. This view was embodied in a manifesto which Russell wrote and which was signed by prominent scientists in capitalist and socialist countries. Albert Einstein was the first to sign (two days before his death) and was followed by Frédérick Joliot-Curie, Max Born, Linus Pauling, and others.

On July 9, 1955, Russell made public that statement which became known as the Russell-Einstein Manifesto and was the starting point of the now well-known Pugwash movement for peace and disarmament. The Manifesto emphasized the tragic situation in which humanity found itself as a consequence of the development of weapons of mass destruction. "In view of the fact that in any future world war nuclear weapons will certainly be employed, and that such weapons threaten the continued existence of mankind, we urge the governments of the world to realize, and to acknowledge publicly, that their purposes cannot be furthered by a world war, and we urge them, consequently, to find peaceful means for the settlement of all matters of dispute between them," the Manifesto declared. The most important point of the Manifesto, which today has won widespread recognition was that to preserve life on this planet, we as human beings *have to learn to think in a new way* and take practical steps to avoid war and the arms race.

More than three decades have elapsed since the publication of the Russell-Einstein Manifesto which, in our view, would be appropriate to associ-

ate also with Joliot-Curie. Numerous nuclear weapons have been exploded, most sophisticated delivery systems of various ranges have been developed that are capable of getting anywhere on Earth. The nuclear arsenal is immense. But during all those years nuclear weapons have never been used in any of the numerous armed conflicts. The world is aware of the fact that a single use of nuclear weapons would trigger off a worldwide nuclear war which would be disastrous for entire humanity. Independent but remarkably similar research projects undertaken by Soviet and US scientists have revealed that a small fraction of today's nuclear warheads would kill all life on earth not only by nuclear blasts themselves but also as a result of the ensuing "nuclear winter", radioactivity, etc.

Does this mean that people learned to think in a new way, as the Russell-Einstein-Joliot-Curie Manifesto urged them to? Unfortunately, this question cannot be answered in an unequivocal positive way, although numerous anti-war, anti-nuclear movements have emerged and expanded during those years and the Pugwash movement, where mostly physicists are involved, is now supplemented by movements of physicians, ecologists, and, most importantly, a broad popular movement around the world.

The peace and disarmament movements are whole-heartedly supported by the Soviet Union and other socialist countries. All progressives know this and are confident that the world of socialism follows sincerely and honestly the basic principle of its foreign policy—peaceful coexistence of states hav-

ing different social systems and international cooperation for peace and progress of mankind. This policy embodies the main point of the Manifesto, new thinking in the nuclear age. *Thinking and acting* is the response of the socialist world. In his TV address, Mikhail Gorbachev stated, "Today, in the nuclear-and-space age, one cannot think in the terms of the past. Everyone must understand, after all, that everything has radically changed. Today it is no longer the question of preserving peace but survival of humanity."[22]

The plain and eternal truths must be remembered which have governed the life of mankind. They are not measured in megatons of evil destructive force but they alone can confront it. They are Reason and Humanism and have forever been known as Wisdom which is so essential today in the age of (dangerous and not always successful) mastering the powerful atom. This is probably the most important implication of new thinking and new political mentality.

Specific, scientifically sound analysis of the world situation has suggested constructive proposals which add up to a global peace strategy, notably the programme of total elimination of nuclear weapons by the year 2000. The programme calls for the staged solution of the nuclear problem and thus expects human thinking to adapt itself to new conditions and their dynamics against the background of increasing cooperation and international confidence and education in the spirit of peace. Over the recent years humanity, notably the Soviet people, has experienced numerous events, notably the disaster at the Cher-

nobyl nuclear power station. New Soviet proposals on nuclear disarmament and the peaceful uses of nuclear energy rely on this experience also. International cooperation and new thinking are essential if peace is to be preserved and peaceful uses of nuclear energy are to be safe.

The increasing number of progressively-minded scientists truly are thinking in a new way and oppose the nuclear craze, and militarization of space and science. Still, there are quite a few Western scientists who placed their talents and knowledge at the service of the military-industrial complex and are not troubled by any moral dilemmas. This situation is compounded by the fact that today science employs an enormous number of people of various intellectual and moral qualities. Moreover, the work is divided into numerous specific tasks so that the final results of research and notably the technological applications seem very remote. Scientists engaged in militarily applicable research greatly outnumber the "concerned" and, even more so, those actively engaged in the work for peace and disarmament. However, it is also true that humanity's hopes for a better future have always been associated with the best, progressively-minded people who embody reason and humanism.

It is these people who develop humanistic socio-ethical approaches not only to the overriding global issue in today's world but to the sum total (more precisely, system) of global issues of today and tomorrow. At this point, there is no need to consider these issues in detail, for extensive, including Soviet, literature on this matter, is available.[23] We intend to

concentrate on their socio-ethical humanitarian aspects.

First of all, the emergence of global problems makes the social responsibility of scientists an especially urgent issue and provides an important sphere of its realization. Today the social, natural, and technological sciences face numerous problems which are significant both scientifically and socially. "The course of world development confronts mankind with quite a few questions of global importance. Science should furnish correct answers to these questions."[24]

Another, equally important ethical aspect to the global problems is sometimes referred to as "ecological ethics"[25] by which, however, different authors mean different things. What is important is that the awareness and discussion of the threatening aspects and prospects of the ecological situation significantly extend the spectrum of human activities which are morally evaluated. In addition to human relations, these issues have a bearing on man's relationship with living and non-living nature. As a matter of fact, in these relations, too, the real issue is man's attitude to other human beings, although not necessarily his contemporaries, for the harvest of today's impact on nature will be reaped by future generations. These are morally and ethically complicated problems which still await their thorough exploration. Solutions cannot, however, be postponed. It is essentially the question of developing ecological thinking which would provide guidelines for human activities in nature where technological progress brought both positive and negative im-

plications. The facts and statistics are widely known. Over the past 100 years, the energy potential in the world has increased thousand-fold but at the same time nature is being depleted and its pollution has acquired dangerous proportions. For the past 500 years, two-thirds of forests have been destroyed. But, according to Marx, "Man *lives* on nature – means that nature is his *body*, with which he must remain in continuous interchange if he is not to die."[26] Man now needs protection as part of nature and, consequently, the man-nature relationships must be harmonized.

According to economic estimates, in the last decades of the 20th century, the states will allocate from three to five per cent of their gross national product, or at least $150,000 million, annually for environmental protection. Meanwhile, the annual total military spendings are as high as $800,000 million and will spiral to a trillion dollars by the year 2000. This is the way resources are wasted for which the military industrial complex is to blame. Whatever could be done by science and technology to solve the ecological problem would be reduced to nothing by the threat of a nuclear holocaust in which all life on Earth would die. The interrelationship of ecology and politics becomes evident on the global as well as national scale as is the social significance of the struggle for environmental purity.

The ecological problem is inseparable from other global problems, such as prevention of a nuclear disaster and creation of favourable conditions for social and economic growth in the world, eliminating economic underdevelopment, hunger and poverty.

It is inseparable from the need for a vigorous demographic policy. However, its solution would be impossible without increased international cooperation in scientific research and the application of the technological progress for the benefit of mankind, for eliminating most dangerous and widespread diseases, for joint space and World Ocean exploration, progress in education and culture, health care, and, finally, the adaptation and development of man of the future.

The global problems of the present and the future are studied everywhere in the world, including in the socialist countries. Large teams of social, natural, and technological scientists contribute to this research. These activities were partly summarized at an international conference on "Socialism and the Global Problems of Our Time", held in Prague in June 1985 and attended by scientists and experts of the socialist community and representatives of numerous international organizations and scientific centres. The conference expressed a desire to cooperate with scientists in other countries in investigating the global problems confronting the present and future of human civilization. It adopted an Appeal to Scientists and Public Opinion calling on them "to intensify the struggle for peace and disarmament, to learn to think and act in a new way in face of the threat of a thermonuclear catastrophe and the danger of the exacerbation of the entire system of the basic global problems".[27]

In numerous works of Western scientists, however, the socio-ethical and humanitarian aspects of the global problems are either utterly neglected and

technological progress is alone expected to solve them, or are promoted to absolute values and opposed to scientific and social issues. In particular, various concepts such as "united world consciousness" (Julian Huxley), "new humanism" (Aurelio Pecci) and "ecological morals"[28] are advanced. Marxism, as a rule, is left out of the trends of today's scientific thought which rely on humanistic vision of the world and the future of mankind against the background of global problems.

The global problems are now addressed not only by philosophers and preachers but also by statesmen who are by no means inclined to moralizing and scientists who have seen the danger of uncontrolled use of their findings. The awareness of the importance of these problems and the need for new approaches to them is growing in the world. This is true of the entire set of global problems which are common for the whole of humanity and cannot be solved unless human efforts are united in international cooperation. "The global problems, affecting all humanity, cannot be resolved by one state or a group of states. This calls for cooperation on a worldwide scale, for close and constructive joint action by the majority of countries... Such is the main demand of the times in which we live."[29]

All these problems affect, frequently in a most direct way, the future of human civilization. They do not permit to reduce the threat and point to the need for urgent solutions. The thinkers of various schools try to find ways to resolve the global problems. As they approach these problems from different, if not opposing, ideological, political and

philosophical positions, the global problems have become the field of sharp ideological and philosophical struggle.

Solutions to the global problems of the present and the future of human civilization are offered by Marxist humanism which recognizes, on the one hand, the uniqueness of the situation and the importance of solving the multitude of global problems of our times in the context of a general social change towards socialism and communism. On the other hand, it recognizes the need for peaceful coexistence and cooperation in resolving the global problems. The real dialectics of today's development, notes the Resolution of the 27th CPSU Congress on the Political Report of the party Central Committee, is in the historical contest of the two systems and the increasing trend of interdependence of states within the world community. "A controversial but interdependent, in many ways integral, world is taking shape through the struggle of opposites... The last decades of the 20th century confronted the nations of the world with difficult and acute problems. The need for solving the most vital global problems should prompt them to joint action, to triggering the tendencies towards the self-preservation of humanity."[30]

Unlike bourgeois-reformist and leftist radical utopian concepts, Marxism provides scientific grounds for the correct understanding of the essence and significance of the global problems existing between man and society as well as between man and nature, or problems which manifest their universal human nature in the process of interna-

tionalization of production and the entire life of society, which was studied by Marx. As they deal with the system of the global problems, Marx's followers rely now on his methodology in which they combine scientific, social and humanistic approaches and regard man and his future as the key problem. "As we see it, the main trend of struggle in contemporary conditions consists in creating worthy, truly human material and spiritual conditions of life for all nations, ensuring that our planet should be habitable, and in cultivating a caring attitude towards its riches, especially to man himself – the greatest treasure, and all his potentials. And here we invite the capitalist system to compete with us."[31]

The attitude of Marxism to humanism, the role humanism has to play in the Marxist doctrine of society and man and the new interpretation it is given, have remained major issues in the Marxist view of the world, especially now. There is no single conceptual, ideological or political trend which does not address itself to humanism. There is not a single action, including flagrantly anti-human, barbaric actions, which would not be pharisaically camouflaged by this word. This is why the way humanism is interpreted and the word and the deed are united, is so important. Marxism provides a clear-cut and scientifically sound conception of humanism; moreover, here the word and the deed, the theory and the practice are consistent. The humanistic essence of Marxism is integrated with its scientific and revolutionary practical aspects. Marxism therefore acts as real humanism, working for the scientific, technological,

and cultural progress of humanity and the solution of the global problems.

The opponents of Marxism and bourgeois-reformist Marxologists have been trying in various ways to portray Marxism as a purely economic theory having no philosophy of its own, to contrast it with its inherent revolutionary practical essence (especially when treating the Leninist stage of Marxism), or to "discover" Marx as a "utopian prophet" who turned in his early writings to man and humanism and then "betrayed himself" and worked out a theory in which man "disappeared" to give way to rigid "economic determinism" and making an absolute of the "socium". These are, however, crude distortions of Marxism as an integral system.

Marxism as real humanism is a theory of man's and humanity's emancipation and development. Not only did Marx inspire people with the hope for a better future. He provided a scientifically sound picture of the way to that future by developing a new world view, a new understanding of the world and man's role in it, a philosophy which bears the torch of reason, knowledge and humanism. Marxism, which was creatively developed in a new context by Lenin and his followers, today, as an integral Marxist-Leninist science, makes humanism an historically real force. This is what makes Marxism so intellectually and emotionally attractive for progressively-minded people, true humanists who feel deeply all the dangers and alternatives facing humanity. Being, above all, a science of emancipating and developing humanity, i.e. an embodiment of humanism, Marxism views all other aspects of life of

society as the means leading to that goal and the emancipation and development of human nature as the sole and absolute *goal in itself.*

Marx subordinated all his scientific and revolutionary activities to that goal. His objective, which he posed for himself in his youth, to find the "*categorical imperative to overthrow all relations* in which man is a debased, enslaved, forsaken, despicable being"[32] was in his later activities formulated in increasingly more specific scientific and real terms as he looked for ways and means to emancipate and develop man. This was the goal of political-economic and socio-political research undertaken by Marx, notably in his most important work, *Capital*, in which the mystery of capitalist production was unravelled and the natural historic inevitability of transition to communism was proved, to a society in which free all-round development of man will become possible. This demonstrates the true humanism of Marxism which is a merger of sound scientific approaches and practical means, which Marx therefore justly referred to as real humanism.

Today, bourgeois philosophical literature repeatedly tries to prove that under the new conditions brought about by the revolution in science and technology and the exacerbation of global problems where the world political developments, expanding production and culture make new demands upon man, his activity, consciousness and self-consciousness, his will and morals and a nuclear war threatens the very existence of mankind, that under these conditions some new kind of humanism is needed which

would incorporate, in particular, global approaches to man's and humanity's life and future. On the other hand, Marxism-Leninism is alleged to be "hopelessly outdated" and thus dispensable or needing reform to fit the ideals of "humanistic socialism". "New humanism" is declared the basis of a utopian "new society" outlined, in particular, by Erich Fromm who tried to combine philosophic, anthropological, culturological and socio-political approaches. Regrettably, these speculations occasionally quote Marxist writings with which they have nothing whatsoever in common. As Yuri Andropov noted, "new phenomena in social life are sometimes said 'not to fit' the concepts of Marxism-Leninism which is allegedly engulfed by a 'crisis' and so needs a 'reanimation' by injection of ideas to be borrowed from Western sociology, philosophy or politology. What is happening is not, however, a 'crisis' of Marxism. Rather, it is the inability of some theoreticians who pose as Marxists to comprehend the true scale of Marx's, Engels's, and Lenin's theoretical thinking, to apply the intellectual potential of their teaching to specific investigation of specific issues. It would be fair to say that quite a few bourgeois theoreticians in philosophy, sociology and political economy have been busily adapting Marxist ideas to their own liking."[33] This is probably especially true of understanding Marxism as real humanism, as a theory of man's emancipation and development, with the emphasis on science because, for the first time in the history of social thought, Marxism rejected an abstract, non-historical, supra-class approach to human and humanistic problems. It posed these problems

on a sound basis by organically relating the materialization of the ideals of man's emancipation with the truly scientific theory of social development, with the revolutionary movement of the proletariat, with the struggle for communism.

Today, the objective of true humanism, the world historical process of man's emancipation, is also the struggle for vital global objectives, notably peace and disarmament and also for profound socio-economic and political transformations, for overcoming the world economic crisis and new forms of exploitation of the working people, the struggle for democracy and socialism. It is also the struggle for genuine national independence and elimination of colonialism's economic and cultural legacy. Finally, it is the contribution made by socialist countries to the solution of vital economic and social problems, to raising the material and spiritual standards and to all-round harmonious development of man. Consequently, it is Marxism that takes up the great humanistic task on a world historic scale – man's emancipation and development. This task is by no means easy and socialism has to tackle numerous economic, social, cultural and moral problems which did not emerge previously. But the overriding priority of humanism over material production, social relations and culture in socialist society whereby man becomes "the measure of all things", is the lofty ideal and the great principle which alone is capable of protecting humanity and leading it forward along the path of progress.

True, as realists, Marxists are aware that all this remains thus far a goal for the development of man

and thus the real humanism of Marxism is an ideal and a goal which can only be theoretically outlined for humanity as a whole. However, since they have become the practice in socialist countries which are inhabited by a large proportion of mankind, they have become a material force as is always the case when ideals and principles are not imposed on anyone by force. Marxists believe that it is only in the context of peaceful coexistence that all the global problems of human civilization can be solved by scientific, technological and other means of cooperation and that they cannot be solved outside the spirit of scientific, real humanism which is of universal as well as class character.

This approach proves promising in investigating general lines of the socio-cultural and scientific-and-technological development of humanity which faces problems of a global nature. The trends developing now in the world scientific community to make science more humane, to link it to the goals of man and society, to combine research and value judgements, to develop the socio-ethical fundamentals of science and integrate it into the general system of humanistic culture, are welcome. A significant contribution to these goals is made by the International Life Institute founded in Paris in 1960. Its collaborators are over 2,000 scientists of 60 countries including 50 Nobel Prize winners. Many prominent Soviet scientists among them Mstislav Keldysh, Nikolai Bogolyubov, Alexander Bayev, Nikita Moiseyev, Victor Kovda have been active members of the Institute. Its centres are functioning in various countries. The Institute is inspired by Louis Pasteur,

the outstanding French scientist and humanist, who had an unswerving faith in the triumph of science and peace over ignorance and war, in an agreement that nations would come to for the purpose of creation, not destruction. The Institute sees its task in uniting the efforts of scientists in various countries of the world for the sake of serving science and preserving life on Earth.

In early 1986, Professor Maurice Marois, founder and general delegate of the Institute, sent a letter to Mikhail Gorbachev, General Secretary of the CPSU Central Committee, and Ronald Reagan, the US President. In his response Gorbachev wrote, "The Institute is concerned with truly vital issues which in one way or another trouble any thinking person regardless of which country he lives in and even of what ideological views and political convictions he holds. The consequences for people of the use of high technology; food resources and food; the environment and animate nature; ethics and biomedicine; science, education, television and the future of humanity—these and other subjects on which the Life Institute is working, are prompted by life itself and are becoming more urgent, at times sharply acute, with every passing year. Not everyone is perhaps aware of this today but everyone will have to feel and realize this tomorrow—and not later than the beginning of the next millennium."[34]

Mikhail Gorbachev, who highly appreciated the activities of the Institute and its "Science in the Service of Life" programme, described the role to be played by science and its function as follows: "Present-day science and technology offer an opportunity

to beautify, in the full sense of the word, life on Earth, to create conditions for the all-round development of every individual. But it is the very creations of the human mind and human hands that threaten the very existence of the human race. What a crying contradiction! We want science to cease to be the servant of two masters – life and death. We want it to serve life only."[35] He emphasized the overriding importance of establishing sound, reasonable inter-state relations for cooperation and in search for ways to save life and in solving all the global problems on which the quality of life depends. "Mankind can and must live in harmony with nature, but to be able to do so it must live in harmony with itself."[36]

The CPSU leader endorsed Marois's view that life, especially human life is in our times the utmost value biologically, philosophically and politically. He noted that this issue, which had forever been preoccupying the best minds, had acquired a new dimension in this nuclear and space age and revealed its new aspects. "Dostoyevsky wrote in his time, which in terms of history was quite recently: 'The mystery of human life is not merely in living but in what to live for.' I would not dispute this formula, but ponder the new meaning it is being given in the nuclear age. I would say that in our time it is worthwhile devoting one's life to saving life itself on Earth. There is no goal more important."[37]

In our times, man has to save life on our planet. Scientists in socialist countries and all progressive forces of the world have a vital role to play in achieving this goal of first priority. In our days it is increasingly clear that the social, ethical and humanitarian

responsibilities of scientists are not in contradiction to free scientific search. The "human dimension" is essential in both research and in applications. Moreover, the cultural aspects of the scientific and technological progress have to play increasingly important role and should not lose ground to the considerations of material benefits of the technological applications of science or to the alleged inherent uncontrollability of the development of knowledge even if this threatens man's health and life.

This is the view taken by Marxism and its real humanism. Although some bourgeois-reformist theoreticians try to work out their own conceptions of humanism "side by side" if not in contrast with or to supplement Marxism, nothing good has ever come out of these efforts. What, indeed, is this "new humanism" which is supposed to be consistent with new conditions in the world? As a rule, it is a mosaic of conceptions and ideas which manifest only the desire to dissociate oneself from bourgeois ideas of humanism, man and his place in the world. But all this has, as we have shown, been formulated by Marx and his followers. For this reason, Marxist humanism is truly *new* humanism which is to replace the old, bourgeois humanism and is consistent with the new conditions under which humanity lives and develops. This teaching which sees the development of human nature as the declared overriding goal, free development of everyone as a precondition for free development of all, and the all-around improvement of man as an absolute movement, is essentially humanistic. It is destined to triumph because it appeals to the reason and humanism of rea-

sonable and humane man. Of course, the real humanism of Marxism will creatively develop and expand, in particular by integrating universal human approaches.

The need for a new, future-bound real humanism is obvious today in the context of the rapid development of science and technology and the increasingly acute global problems. It will serve as the guideline of a uniform new strategy leading to the future, as the core of a new ethos of science which will pursue the humanistic goals of man's development. This is obvious not only in the approaches to physical problems and the ensuing moral dilemmas or to the solution of the global problems of today and for the future of humanity. The progress of the sciences of life and man which has been accelerating its pace in recent decades and years, gives rise to new socio-ethical issues which are at least equally acute as the earlier ones and, most important, more subtle. These issues require special attention.

NOTES

[1]J. Robert Oppenheimer, *The Flying Trapeze: Three Crises for Physicists*, Oxford University Press, London, 1964, p. 56.

[2]C.P. Snow, *The Two Cultures: and a Second Look*, Cambridge, At the University Press, 1965, p. 32.

[3]Victor F. Weisskopf, *Physics in the Twentieth Century, Selected Essays*, The MIT Press, Cambridge, Massachusetts, 1972, p. 340.

[4]Frederick Soddy, *Science and Life*. Aberdeen Addresses, John Murray, London, 1920, pp. 36, 107.

[5]*Encyclopaedia moderna*, 1975, Godina X, No. 30/1, p. 51.

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CHAPTER 5

Ethics in the Context of Contemporary Biology: Evolutionary-Genetic Roots of Ethics. Genes – Intelligence – Ethics. Social-Biologism: Elitism and Racism

To continue our discussion of the science-ethics relationship, let us consider certain results and trends observed in the evolution of biology today, which in fact constitute biology's "challenge" to ethics. First of all, it concerns attempts to substantiate ethical imperatives and norms of relationships between people proceeding from biological data and, second, the achievements of and, more important, the prospects before the biological science causing situations that cannot be easily assessed from the point of view of existing ethical norms. We have already noted efforts to improve ethics through the application of strictly scientific methods and by using intra-science ethical norms as a model for restructuring ethics on the scale of entire society. Recently, the search for a "science-based" ethics rather unexpectedly turned in a new direction.

The tendencies of biologicization, designated by the general term of "social-biologism", have been revitalized today due to a greater scientific interest in the biology of man and new vistas opened up in this sphere at the current stage of the scientific and

technological revolution.[1] Now we shall only consider that which directly or indirectly concerns problems involved in the ethics of science, and first of all the problem of evolutionary-genetic prerequisites of man's higher ethical characteristics. In debating this question, particularly when speaking about altruism, some researchers lay stress on certain arguments contained in Darwin's works, especially in his *Descent of Man and Selections in Relation to Sex,* and also on P.A. Kropotkin's conclusions on the evolutionary-biological roots and development of morality, altruism included.[2]

Attempts to substantiate ethics in evolutionary terms, in particular from the positions of social-Darwinism, have always been connected with widely diverse ideological and political trends, up to directly opposite ones. For example, at the beginning of the twentieth century, John Rockefeller announced that the growth of big business is nothing else but the survival of the fittest persons. Rudolf Virchow, however, came out against the evolutionary theory in 1877 since, in his opinion, Darwinism logically led to socialism. The historical fact should be stressed that an evolutionary, social-Darwinist substantiation of ethics was one of the ideological sources of racism and fascism. Of course, all this had nothing to do with either the theory of evolution or with genuine Darwinism; it was just speculation on their authority and an anti-scientific distortion of their essence. Still, we should bear in mind that certain supporters of Darwinism formulated a whole series of one-sided conclusions which were acclaimed by all kinds of reactionaries. German biologist Ernst Haeckel, for

example, wrote in 1904: "Though the considerable difference we observe in the intellectual life and cultural situation of the higher and lower human races is common knowledge, their relative vital value is usually not understood correctly. That which raises people so high over animals, including those belonging to closely related species, and that which renders their life infinitely precious – is their culture and a more developed mind making people capable of assimilating culture. For the most part, however, this is typical only of the higher human races, while in the lower races these capabilities are developed but weakly or are not present at all... Consequently, their individual vital value should be assessed in different terms."[3] Today, at the close of the twentieth century which provided formidable examples of genocide justified by similar arguments, we cannot but be seriously concerned about new attempts to directly trace man's higher social characteristics, ethics included, to biology.

The question of whether ethics is rooted in biology, in particular those aspects that emerged mostly under the impact of ideas formulated by Sigmund Freud and ethologists Konrad Lorenz, Robert Ardrey et al., are widely discussed in world science. This is clearly reflected in *Biology and Ethics,* a collection of brief reports and statements made at a symposium held at the Royal Geographical Society in London in 1968.[4] Several theses relevant for the subsequent analysis were presented at the symposium; they are all the more important since they are often referred to today, though, regrettably, without mentioning the sources.

In his Introduction to the collection, John Ebling, one of the symposium's conveners, noted that the concept of natural selection formulated by Darwin had irretrievably changed man's concepts of his own origin. That, however, was only the beginning, since the investigation of human behaviour gave rise to new problems. Special emphasis was laid in the natural selection hypothesis on the contest between individuals, which always takes place in their struggle for existence.

It has how become clear that in many areas of the animal kingdom, continued existence of a species to a greater degree depends on the survival of social groups than of an individual. The group has two chief advantages: it ensures defence from enemies and is more efficient in gathering food. Thus, the principle of selection begins to operate at the level and within the limits of the group; joint action by individuals proves to be a factor of vast importance for the evolution. If, then, it is established that in the course of evolution the survival of groups becomes more important than the survival of individuals, it can be asserted that this is due to two circumstances: on the one hand, more often than not organisms act in common, i.e. "cooperate" rather than compete, and on the other, individuals may be sacrificed or sacrifice themselves for the sake of the group, and here we see the origin of altruism. Thus, Ebling asks himself whether there is any ground to regard this phenomenon as the origin of ethical behaviour, i.e. a behaviour which contains the possibility of option, if we assume that the terms "cooperation" and "altruism" can be used to describe behavioural phenomena.

In biological terms, the nature of such options seems to be clear. The principle arises from the conflict between the mechanisms which help the organism (a separate individual) to survive, and those which assist in the survival of the social group as a whole. It can be presumed that such individual stimuli as hunger, sexual attraction and fear, contain instinctive components which may be turned to the service of society as a result of upbringing and education. This approach, though, would not be absolutely correct since all kinds of behaviour are conditioned both by genetic (inborn) and ecological factors. Thus, the need for an ethical option may be caused by a conflict between acquired models of behaviour. According to Ebling, it is only part of our ethical behaviour that passes through our con-

sciousness. Further, he considers the question of when and how ethical behaviour emerged in the course of evolution. He writes that birds also show examples of altruism and that they, too, can "learn"; still their behaviour is largely genetically programmed. In order to trace the origin of ethics in the course of evolution, one should concentrate his attention on the evolution of mammals, and first of all, of the primates who are a species closest to man. This proposition, which Ebling shares with some other scientists, is based on a speculatory admission that man occupies his unique place because in the course of evolution (development, to be more exact) his ethical behaviour is realized and codified.

From Ebling's point of view, behaviour which serves the interests of the group but may clash with the aspirations and desires of an individual, is subject to evolutionary development and is at the same time its result. Such behaviour is "inherited" and becomes to some extent "built" into each individual through the "conscience" mechanism and then is reinforced and maintained in society by a range of devices, from informal sanctions to the formal threat of the law. Ethical concepts, according to Ebling, are not only injunctions from society to its members, they are also instructions from individuals to society.[5] Thus Ebling, while trying to establish a link between man's biological nature (substratum) and ethical norms, in fact fails to arrive at a logical conclusion and only states that ethics has biological, evolutionary roots.

In his article "Towards the Biological Definition of Ethics", M.R.A. Chance makes an attempt to render this idea more concrete. He says that the purpose of his article is to construct a "behavioural model" for ethics. In his opinion, behaviour is a link in the relationships between an organism and its environment, thus the investigation of this model may provide an insight into the process studied by Darwin. Such an investigation, however, was never undertaken before ethology, which is the latest product of the evolution of the behavioural science, came into being. In his opinion, "an ethic is simply a statement in language of the way in which it would be desirable to change behaviour in a given direction"[6]; he proposed that the principles of ethology be applied in selecting leaders both in politics and economics.

In "The Development of Moral Attitudes and Behaviour", an article by B.M. Foss, it is noted that both for the evolution of animals living in groups and for the evolution of man, those aspects in their behaviour which promote the survival of the group are of greater value than those which are important for the survival of an individual. Hence the logical conclusion that on a broad scale such survival should be dependent on the evolution of the structure of groups themselves; it is also possible that new individual traits can emerge through selection. However, whereas in lower animals one would expect "altruistic forms" of behaviour to depend on instinctive mechanisms, in man one would expect them to depend largely on learning.[7]

We have dwelled on the ideas contained in *Biology and Ethics* because they became a reference point for quite a few similar interpretations that were suggested in subsequent years. This mainly concerns so-called sociobiology which is acclaimed by many scientists in the West while at the same time being ruthlessly criticized, in particular, by Marxists.

The position of sociobiology on the evolutionary-genetic prerequisites of man's socio-ethical characteristics came in bold relief in *Sociobiology*, the first work published by one of its founding fathers, Edward O. Wilson.

"Let us now consider man in the free spirit of natural history, as though we were zoologists from another planet completing a catalog of social species on Earth. In this macroscopic view the humanities and social sciences shrink to specialized branches of biology; history, biography, and fiction are the research protocols of human ethology..."[8]

According to Wilson, the question of whether there is a genetic predisposition for people's belonging to a certain class, for their playing a particular role in life, is a key problem of the biology of man. One can easily imagine the circumstances in which such genetic predisposition comes under consideration. In answering this question of cardinal importance for contem-

porary philosophy and psychology, Wilson says that heredity can be traced in certain parameters of the intellect and certain specific emotional characteristics; a hereditary fixation of the social status, though, is hardly possible. Commenting on Indian castes, which have existed for two thousand years, Wilson notes that members of various castes do not differ from one another significantly in genetic terms, in their measurable anatomical or physiological characteristics (for instance, the blood group). He reasonably points to many instances, provided by history, of the erosion of distinctions between different classes under certain circumstances and also mentions frequent cases of "functional" transition of representatives of one class leaving the ranks of their own class to join those of another. He points to "mixed" marriages (between members of different classes), to representatives of different classes participating on the same level in the political and economic life of a country.

Wilson's approach to the analysis of man's sociobiological traits puts his conception somehow apart from clearly-defined varieties of social-biologism, yet on the whole its methodological principles are the same. Wilson's conception lacks a definite answer to the key question of the correlation between social and biological traits in man; in many cases, moreover, biological traits are raised to an absolute.

Thus, in Wilson's opinion, altruism should be considered from the angle of the species. He denies the fact that the existence of altruism in the animal kingdom contradicts the concept of natural selection underlying the theory of evolution. Raising the question of how altruism, which in itself contradicts individual adaptation, could arise and develop in the course of natural selection, Wilson provides the answer: through kinship. If the genes accounting for an inclination towards altruism are typical of two organisms due to their common origin and if an altruistic act increases the joint contribution of these genes to the next generation, the inclination towards altruism will be spread to the entire gene pool of the population.

The principles of this kind of approach to the problem of altruism and its origin were formulated in 1964 by British biologist W.D. Hamilton, who viewed it as a trait developing in the course of biological evolution, which assists the individual in spreading its genes, i.e. he essentially defined altruism as genetic egoism. This is how Hamilton explained, in particular, the social life of insects: in all species of ants, bees and wasps, the female progeny of one mother have on the average three-quarters of common genes. Since these "daughters" are related to one another more closely than their progeny will be, they are genetically interested, not in propagation but in catering to their own mother who will give birth to another strain of daughters. This is the reason for the appearance of barren female workers who cooperate in their own commune because of egoistic genetic reasons.

US biologist Robert L. Trivers, elaborating on these ideas, came out with the concept of mutual altruism, which explains, in particular, the fact that some species of birds give a sign of warning to the whole flock, even if there are no fledglings of their own or close relations in it. In his opinion, this is characteristic of all organisms, so there is no reason to believe that human beings are the only species in which altruism has no genetic roots.

The concept of mutual altruism became the groundwork of sociobiology. Wilson spreads it to other ethical phenomena as well. Both "scientists and humanists", he maintains, "should consider together the possibility that the time has come for ethics to be removed temporarily from the hands of the philosophers and biologicized".[9]

Wilson's point of view essentially amounts to that ethics, as a philosophical discipline closest to biology, should not be construed by purely logical categories of thinking, being itself connected with the interpretation of human behaviour which has its roots in the biological evolution of man and the primates; as for altruism, this phenomenon can even be traced to the invertebrates. Hence the conclusion concerning the biologicization of ethics cited above.

However, it remains unclear why it is considered impossible to study and formulate many proposi-

tions of ethics at its present level, being objectively elaborated by society (as an aggregate of behavioural norms) and by scholars (as an aggregate of philosophic and conceptual systems). Moreover, why biologico-genetic research is not to supplement philosophical studies or be conducted as an independent form or "model" of research into the problems of ethics, primarily its genesis.

Similar ideas concerning, in particular, the genetic roots of altruism, are offered by Richard Dawkins in his book *The Selfish Gene*.[10] According to him, people, like other animals, are machines built by their genes. In a world in which competition is prevalent these genes have survived only because of their "ruthless" egoism. But if the genes are egoistic, then, logically, our individual behaviour should be egoistic in equal measure. Thus behavioural types, which are seemingly altruistic, emerge only because in definite conditions altruism serves to promote the gene's egoistic objectives. The genes, he maintains, are not only merely egoistic; they also have a herd instinct, wage a fierce competitive struggle, and can be "happy", "loyal" or "ruthless". In a word, Dawkins describes the genes in such a way that they seem to be pursuing conscious goals.

In the last chapter of his book, "Memes: the New Replicators", Dawkins denies what he himself stated before: man is not a simple genetic machine, but a "unique" species, so evolutionary ideas should not be directly applied to his social behaviour. This is so because man is the product not only of organic, but also of cultural evolution, in the course of which the meme – a basic unit which transfers the capability of forming and assimilating ideas – assumes the role played by the gene in organic evolution. However, the memes, too, owe their success in cultural evolution to their egoism.

In his comment on Dawkins's book, geneticist Gunther S. Stent notes that as a rule the concepts of egoism and altruism are linked to the concept of moral value. Altruism (the value is something good)

spells respect shown by one man to the interests of others, while egoism (the value is something bad) means disrespect of these interests. In Dawkins, however, the concepts of altruism and egoism are outside the concepts of good and evil, since he deals only with the conditions for survival and not with respect for interests. In his opinion, the fact that some animals kill and devour other animals is a fine example of egoism, while altruism is embodied in a hen defending her chickens. Thus he takes the concepts of egoism and altruism outside the sphere of ethics. Dawkins uses the concept of egoism to designate what Darwin called adaptability. He also provides his own definition of the gene: according to it, the gene is any part of chromosome material which potentially remains intact in a sufficient number of generations to serve as a unit of natural selection. Stent holds that, as compared to the generally accepted concept of genetics, this warped definition amounts to a blurred and euristically useless notion, the more so since Dawkins himself says there is no such unit in existence. He once explained that he only uses the word "gene" to make the title of his book more attractive.

Such open biologicization of social phenomena is not supposed to be euristically effective. Nor can it throw light on the evolutionary-genetic foundations of ethics, in particular on the sources of egoism and altruism, which have been the subject of numerous investigations of late. Generally speaking, it cannot serve to elucidate the role and significance of the biological component in the formation of man's behaviour we assess in ethical categories. Understand-

ably, the sociobiological interpretation of ethical questions, and of values in general, meets with active opposition.

Many scientists try to make the method of reducing ethics to its biological component serve positive humanist goals and mankind's progress (at least, this is their initial purpose). Such attempts have found their most graphic manifestation in the work of British biologist Julian Huxley, who tried to create a concept of "evolutionary humanism".[11] In short, it amounts to the assertion that man's attraction to education, culture and scientific knowledge is conditioned by evolutionary-genetic reasons; it testifies to a continuous development and improvement of human nature which Huxley interprets, as distinct from Lorenz and Ardrey, in an altruistic spirit. Huxley takes an optimistic view of the future, though he treats it from the abstract-utopian position of "world conscience". In many respects, he is a forerunner of a number of modern conceptions of the future in the aspect of global problems and of "new humanism" preached (regrettably without reference to Huxley), in particular, by some members of the Club of Rome.

Let us once again emphasize the limited nature of the general methodological base of evolutionary-genetic ethics and the extreme nature of its conclusions, typical of Lorenz, Ardrey and Huxley, as well as those who flock today under the banner of sociobiology. The erroneousness of the given position does not lie in the striving to investigate regular, natural biological prerequisites of man's social behaviour, including his ethical characteristics. Engels

and Lenin pointed to the importance of such investigations in respect to man's thinking and consciousness. From this angle, evolutionary-genetic and ethological data are of vast significance. Engels wrote: "It is, however, inherent in the descent of man from the animal world that he can never entirely rid himself of the beast, so that it can always be only a question of more or less, of a difference in the degree of bestiality or of humanity."[12] Still, one cannot but see in the works of many ethologists, Neo-Freudians and sociobiologists, as well as of those who rely on their conclusions on the origin of ethical values, that they overestimate "the degree of bestiality" while underestimating "the degree of humanity", i.e. they make an absolute of the importance of biological factors and minimize that of social factors. In Lenin's words, "Nothing is easier than to tack an 'energeticist' or 'biologico-sociological' label on to such phenomena as crises, revolutions, the class struggle and so forth; but neither is there anything more sterile, more scholastic and lifeless than such an occupation."[13]

The position of "extreme genetic determinism", i.e. social-biologism, in dealing with man's ethical characteristics has been reflected in its clearest form in a book written by Edward O. Wilson in coauthorship with Charles J. Lumsden, *Genes, Mind, and Culture. The Coevolutionary Process,*[14] in which not only ethics but human culture in general are described as conditional on some "culture-genes" coded in man's genotype.

Finally, in one of their later works, *Promethean Fire. Reflections on the Origin of Mind,*[15] Lumsden

and Wilson assert that culture is created and determined by biological processes, the latter undergoing changes in response to changes taking place in culture. This is a variety of "social Lamarckism", though the authors keep proclaiming their adherence to Darwinism.

In dealing with approaches to the new science of man, Lumsden and Wilson directly oppose their own social-biologistic views to Marxism, in particular, to the fundamental thesis of Marxist philosophy on the primary nature of being and the secondary nature of consciousness, and deny the social essence of man. In their opinion, the new science of man must regard the historical process as a result of interaction between biology and culture, as a "gene-cultural coevolution", which will make it possible to create a social science free of value orientation, i.e. a truly objective science.

The principles on which the new science of man should be built are as follows: (1) all spheres of human life, including ethics, rely on the human brain as a physical foundation and are part of man's biology; no one of these spheres can be excluded from application of methods used in the natural sciences; (2) mental development has a more complicated structure than was thought before, and so, most of the forms of perception and thinking (if not all of them) are determined by genetically-programmed processes taking place in the brain; (3) the structure of mental development has emerged in the course of the life of many generations under the impact of a specific form of evolution ("gene-cultural coevolution"), in which the genes and culture change together; (4) the influence of the genes, even if it is fairly strong, does not exclude freedom of the will; on the contrary, while exerting an influence over culture, the genes create and maintain the possibility of conscientious choice and decision-making; (5) predisposition (inclination) towards certain things emerges as a result of the interaction between a special kind of genes and the environment; (6) various ethical norms are all based on particular inclination and can be changed; (7) the establishment of a genuine science of man could be conducive to social experiments influencing the deepest sources of man's motivations and moral judgements.

As we have seen, Lumsden and Wilson not only advocate the profoundly erroneous postulates of the "new science of man", they also support its manipulatory claims and ambitions. These are devoid of ethical regulators since they are determined by sociobiology itself. All this, no doubt, can hardly serve to open up the road for a new-type science of man. The sociobiological concept meets with criticism not only from Marxists, whose position is either ignored or distorted, but also from many non-Marxist Western scholars as well.

For example, in his article, "The Ambiguity and Limits of a Sociobiological Ethics", Lawrence M. Hinman noted that Wilson was not satisfied with the appeal contained in his book, *Sociobiology: The New Synthesis*, to biologicize ethics by removing it from the hands of philosophers. He also decided to fulfil this task in his more recent work, *On Human Nature*, returning to these themes within a broader context. Both books give a good idea of what Wilson had in mind in urging the biologicization of ethics. Moreover, in Hinman's opinion, the material presented in both books reveals a "fundamental ambiguity in Wilson's own understanding of what is involved in the task of biologicizing ethics".[16] This also testifies to the necessity of continued philosophical study of ethical problems. Any attempt to create ethics based exclusively on the sociobiological theory, Hinman says, is doomed to failure due to the limited nature of such an approach.

According to Wilson, Hinman notes further on, we find ourselves in a vicious circle because of being forced to choose between certain elements of human nature, turning to the system of values produced by these elements in bygone times. Wilson suggests that this vicious circle be broken by an effort of will by imposing the values which have been put forward by sociobiology and related disciplines, such as preservation of humanity's general gene pool, diversity within its boundaries, etc. Wilson asserts that the preservation of the general gene pool over the life of many generations contradicts the imperatives of egoism

and tribalism (the tribes' isolation) typical of human nature. In other words, Wilson confirms that, in trying to attain a value he himself put forward, man must go against his own nature. At this point, Wilson inevitably faces the problem: on the one hand, what are reasonable grounds for recognizing the value he proposes, and on the other, what are the psychological motives? As Hinman sees it, there is no answer to either of the questions. The same is true of other values Wilson names as the chief ones in the future "biologicized ethics".

The conclusion drawn by Hinman is absolutely correct, though it is not substantiated either in terms of methodology or in concrete biological terms. The crux of the matter lies precisely in the fact that sociobiology does not just offer certain pseudo-scientific explanations, but also poses problems which should be thoroughly analyzed.

Sociobiology is ruthlessly criticized, both in ideological and scientific terms, by US geneticist-evolutionist Richard C. Lewontin, British neurobiologist Steven Rose, and US psychologist Leon J. Kamin.[17] They all note that the thesis on the genetic determination of social organization through natural selection presupposes that society is always optimal in a certain sense and therefore it does not need to be restructured. The weakness of Wilson's logical argumentation is revealed in the following example. In his words, in hunters' societies, men were engaged in hunting and women stayed at home. The existence of a similar tendency in agricultural and industrial societies led him to the conclusion that this type of social relations is of genetic origin. "If the logical circle is not evident in this assertion," write Lewontin, Rose and Kamin, "then

what about the assertion that, since Finns are 99 per cent Lutheran, they must possess the gene of Lutheranism?"[18]

As for sociobiology's ideological aspects, it opens the door to the legitimization of the existing class pressure in society by maintaining that all traits of human behaviour are of an adaptive nature. "We are the result of millions of years of evolution. Do we have the right to come against social relations to which the wise nature has specially adapted us?... This biological Pan-glossianism, an inevitable element of argumentation used in biological determinism, has up till now played an important role in the legitimization of the social status quo. To assert that even altruism is a result of selection in the interest of reproductive egoism, is to reaffirm the principle of individual egoism... Sociobiology is just a new attempt to provide a natural-science substantiation for the theory of Adam Smith. It combines vulgar Mendelism and vulgar Darwinism with vulgar reductionism in order to place them at the service of the social status quo."[19]

The extreme positions of naturalism and social-biologism, in particular on the issue of evolutionary-genetic prerequisites of man's ethical values and first of all altruism, came under sound criticism on the part of Soviet authors, too.[20] At the same time, some scholars stress the importance of evolutionary-genetic prerequisites of man's ethical characteristics, in particular altruism, while overcoming these extreme postulates. The very posing of this problem, however, often manifests inconsistency and contradictions.

Treating of the socio-ethical problems of human genetics, V.P. Efroimson, for example, maintained that, if we concentrate on the specific operation of the natural selection experienced by humanity in the course of its evolution, then it would become clear that it is this natural selection, the cruellest of all nature's laws, that has produced altruistic emotions of unprecedented power and stability in the human race. As distinct from sociobiologists, he thinks that the last word in the resolution of problems involved in the origin of human ethics and humanism, should be pronounced not by geneticists but by philosophers, who must have their eye on the fact that ethics was established under the influence of both social and biological factors.

Efroimson developed these ideas in his article, "Genealogy of Altruism". On the whole, the basic principles presented in the article were supported by Soviet scientists, in particular by B.L. Astaurov. Essentially, they are as follows: Man with his potential mental abilities and ethical traits is not just a white sheet of paper at birth, on which the environment and education write whatever they like. In Efroimson's opinion, there is something in man's hereditary nature which accounts for his eternal thirst for justice, self-denial and heroic feats. He emphasizes that "the postulated idea does not in any measure deny the role of the social environment and education in the formation of a person's ethical principles. There is no doubt that any organism, and in particular man with all the properties of his psyche, behaviour and ethics, is the product of his environment."[21]

Efroimson makes the reservation that he leaves aside the question of the significance of social conditions and the impact of labour on the formation of ethical principles in man but focusses on the hereditary mechanism of their formation. However, this form of representation seems to be inadequate. To investigate the emergence and development of moral traits in man outside the social context, without taking it into account, is just impossible, for it is this context that determines the essence of these

traits. It is impossible to correctly show the genuine importance of evolutionary-genetic prerequisites of man's ethical characteristics, in particular altruism, while not taking into account the dialectics of the social and biological in him, and without the mediation and transformation of his biological essence by mankind's socio-historical experience.

The article by B.L. Astaurov, "Homo sapiens et humanus – Man with a Capital Letter and Evolutionary Genetics of Humanism", describes this dialectic, in which the social essence prevails over the biological and in fact subordinates it, in more detail, though still not fully enough. The article abounds in factual and historico-biological material and is specially written in response to Efroimson's above-mentioned article. Astaurov speaks, in particular, of the removal of the alternative: education (environment) – nature (heredity), of the leading role of social environment and of the determining impact of social factors and laws in the evolution and ethics. He also states that "conditions provided by the social system and processes involved in the transmission of the store of knowledge, customs and notions, which constantly snowballs and changes, have come to play a leading role in the social phase of mankind's evolution, leaving far behind in its way the slow changes occurring in the hereditary gene pool, though not denying the fundamental significance of biological laws."[22]

These and other postulates presented in Astaurov's article give the lie to assessments of his general position as upholding biologicization, widely current in Soviet literature. We think that there are more worthy objects for Marxist criticism to be found among the issues under review, for example, sociobiology which has not yet been subjected to serious critical analysis. Meanwhile, its methodology is really alien, as has been shown above, to the Marxist teaching on man, his social essence and

ethical characteristics which also have social roots, though not being directly opposed to evolutionary-genetic factors. A complex approach to man largely relies on a system of interlinked disciplines and methods of cognition applied in biology and medicine. Since man is regarded in the domain of scientific knowledge as the unity of biological and social features, i.e. not only as an individual but also as a personality, a part of the social organism, studying him involves sociological, behavioural and humanitarian approaches and methods. Sometimes these approaches and methods are applied to the problem of life in general, since that problem as an object of research cannot be fully isolated from specifically human relationships and assessments. It is only an outward "coexistence", the "neighbourhood" of these qualitatively heterogeneous approaches and methods that are typical of the present state of knowledge on life and man. Moreover, in many cases they prove to be mutually exclusive in the process of concrete investigations. As a result, man becomes a dismembered object of cognition. Thus, we can learn about him everything except that which comprises his integrity as a person and a biosocial being subject to many integral laws and "systems forces", emerging in the interaction of a number of factors of a biological, psychical and social nature.

In our opinion, not only biologicization but also efforts to represent man as a "clot of socium", to disrupt the interaction between social and biological factors involved in his emergence and development—for example, in the notions of man's "two programmes", social and biological, and his "two

types of heredity", also social and biological – play a negative role. The dialectics of the social and biological in man does not exist in a definite relationship, given once and for all, even if we deal with the primacy, domination of the social. The dialectics consists in the mediation and transformation of the biological by the social, not in the disruption of the link between them. The existence of such a link is beyond any doubt, and it is being investigated by several branches of Soviet science, in particular in ethological studies and in the analysis of evolutionary-genetic prerequisites of higher manifestations of human traits.

Biologicization tendencies should be opposed by a dialectical approach, eliminating the alternative – the genes or the socium. This approach is of great importance in the struggle against social-biologism and its anti-humane manifestations, in particular in elitism and racism. The latter are relying today on the concepts of genetic determinism, such as, for example, the interpretation of the descent of man's ethical features in social-biologistic terms. Ethical judgements pronounced in the debates on this issue, as will be shown, refer not only to the consequences of the research, but also to the goals set and the methods used, and even to the forms and ways of publicizing their results. The sharpness of these debates is largely explained by the extreme social topicality of the issue under discussion, as well as by some historical reasons, which should be mentioned here.

Two hundred years ago, the ideologists of the French bourgeoisie advanced the slogan, "Free-

dom, Equality, Fraternity", which was inscribed on the banners of the French Revolution and inspired bourgeois revolutions in other Western countries. The further development of bourgeois society, though, could hardly be interpreted as a realization of the ideals of freedom, equality and fraternity. Today, too, developed capitalist countries, while possessing a high economic, scientific and technological potential, are far from being an embodiment of these ideals. The most convincing proof of this is the continuous aggravation of social contradictions, shaking the mainstays of bourgeois society. Nevertheless, for the broad circles of the democratic public, the ideals of freedom, equality and fraternity are still very attractive. The working class of capitalist countries takes an active part in the struggle to win genuine socio-economic equality. The national liberation movements in developing countries are also being drawn into this struggle on an ever broader scale, as well as the oppressed ethnic and religious minorities in capitalist countries.

Contemporary bourgeois society officially proclaims the principle of formal equality, which is often interpreted as the equality of opportunities placed at the disposal of all individuals, irrespective of their social status, sex, race, ethnic affiliation and religious views. Why, then, does not this formally proclaimed equality lead to actual equality? What are the roots of the actual prevailing inequality? Is it possible at all, and in which way, to overcome it? Many trends of bourgeois social thought are busy composing answers to these questions.

The works in which social inequality is explained by biological reasons, i.e. by the age, sex, race, and individual genetic distinctions of people, occupy an increasingly prominent place among these trends. This approach is nothing new in itself. Let us recall that equality, as interpreted in the nineteenth century, usually concerned only people with white skin, and even from this category representatives of "inferior" nations were often excluded. We can also recall social-Darwinism with its thesis that in the course of the struggle for existence the upper rungs of the social ladder are occupied by individuals and groups of individuals more gifted in biological terms. References to biology were also made in their pseudo-argumentation by the theoreticians of genocide. In all these cases, biologists had to come up with criticism of such views and to prove that they had nothing to do with the information provided by biological science.

Thus, the interpretation of the results of investigations related to the biology of man often triggered heated ideological discussions, primarily in connection with investigations into human genetics. The most typical problems coming up for discussion are: the influence of age on man's creative abilities; the role of sex distinctions and their impact on mental activity, especially in the sphere of science; the role of genetic distinctions in the formation of society's social structure; genetic and intellectual distinctions between races and ethnic groups.

The central place among all these topics belongs to the heredity versus environment problem, which has been debated for a long time now. The chief con-

troversy is the relative role played by heredity and the environment in determining man's abilities, in developing his personality traits. Relevant here is the way Amitai Etzioni, a US sociologist, describes the evolution of US public opinion in respect to biological methods of "improving man" in his book, *Genetic Fix.*[23]

Public opinion, Etzioni writes, vacillated like a pendulum – from recognition, in the first decade of the twentieth century, of the thesis according to which man is governed by biological instincts (sexual attraction, hunger and aggressive moods), to the adoption of the antithesis, i.e. the concept of man as a product of the environment. When the theory of instincts became firmly associated with European fascism and US racism, the point of view prevailed which emphasized the role of upbringing and the need to offer people equal opportunities.

In 1966, however, the study of US sociologist, James S. Coleman, was made public. He came to the conclusion that there is no correlation between the mental development of a child (measured by means of a series of intelligence tests) and the organization of the educational process, the teaching staff standard and the technical equipment of schools. Children's varying intelligence is determined, according to Coleman, by the family, neighbourhood and peers; the school is not the source of distinctions in children's mental abilities and cannot do anything to eradicate them.[24] The implications of Coleman's study instilled pessimism in regard to opportunities to be provided by upbringing and education. Certain interpretations stated that the difference in children's intelligence mostly depends on inherited genes, though this conclusion did not directly follow from the results of Coleman's work. Arthur Jensen and Richard Herrnstein, for example, maintained that intelligence is largely determined by genetic factors. (Jensen claims that 80 per cent of the variance is due to genes and only 20 per cent, to environmental factors.) Relying on these data, sociologists Nathan Glazer and Irving Kristol led an attack by conservative circles against the concept of equality. "Thus," Etzioni wrote, "the ground was readied for the next crop, without anyone con-

sciously plowing in that direction: let us improve the genes to improve society."[25]

It seems improbable that this trend could arise spontaneously. However, the fact remains that today these ideas enjoy considerable support among the US public. Voices are now raised demanding forcible genetic testing of pregnant women in order to reveal and operate on foetuses with the XYY chromosomal set which is regarded, according to highly doubtful information, as especially widely spread among persons committing violent crimes. "And, I wondered," Etzioni exclaims, "would a day soon come when society would pressure or require, such parents to abort their 'criminal' unborn child."[26]

It is true, however, that adherents of the genetic determination of intelligence often meet with vigorous protests. For example, William Shockley, one of the transistor inventors and a Nobel Prize winner, who proposed a programme of research into genetic distinctions of races, was qualified as a fascist and paranoic at a symposium of the American Psychological Association in 1971. He had to abstain from reading a course of lectures at Stanford University and from making public speeches. The same punishment was meted to Herrnstein and Hans J. Eysenck. The students put the former's photograph on the announcement board, supplying it with an inscription that he is engaged in research to support racism. As for the latter, his articles were rejected by journals and his books were destroyed in libraries. In London where he was invited to read a course of lectures, he was beaten up by the students. Things went so far that in 1972, fifty world-renowned biologists had to voice their protest against the harassment and accusation of fascism of those scholars who were engaged in investigating the role of heredity in man's behaviour.

Typical of the current debates on this topic, as distinct from the past discussions, is that considerable space is given to the problem's ethical aspects. Two circumstances may account for that. The first is that bourgeois ideologists often refer to biological differences between people to justify the misanthropic policies of racism and genocide. The scientists en-

gaged in biosocial studies today cannot but take into account that their findings may well be used to anti-humane political ends. In other words, past experience has taught them to beware of possible adverse interpretations of the results of their investigations. The second circumstance is connected with a sharply growing interest in ethical problems of science as a whole. At the present time, when humanity increasingly confronts the negative aspects and effects of scientific and technological progress, carelessness in respect to the possible uses of the knowledge gleaned by scholars becomes invalid on the ethical plane. Indeed, such a stand meets with censure (sometimes assuming cruel and inadequate forms) from the scientific community as well as the public. This is vivid proof of the high passions at play in the ideological and socio-ethical debates related to sociobiological research.

As was noted, ethical problems facing science are often considered in conformity with the following pattern: participants in the discussion proceed from the fact that any result of scientific research is materialized through technological devices and processes, based on its findings, which exert, directly or indirectly (i.e. through immediate results or more distant effects produced by their operation), an influence upon social life. The discussion is pivoted on the question of whether science and the scientific community are responsible for technological applications of the results of their studies, and if they are, to what extent. Supporters of imposing ethical controls over the development of science uphold in such situations the thesis of the scientists' responsi-

bility. On the other hand, their opponents maintain that neither science nor the scientists can be held responsible for applications of their findings, since the areas of application are determined not by the scholars themselves, but by political leaders.

The latter point of view is held, for example, by Arthur Jensen, an outstanding advocate of the heredity concept. "An important distinction, often not made or else overlooked, is that between scientific research and the specific use of the research findings in a technological application with a highly predictable outcome. The classic example is the atomic bomb. Should Einstein have desisted from the research that led to $E = mc^2$?"[27] However, the example Jensen provides does not hit the mark, since, as we have pointed out, it was Einstein himself who tried to prevent the bombing of the Japanese cities. He was one of the initiators of the scientists' movement against a nuclear arms race and treated the ethical problems society faced in connection with the advance of modern physics, and in particular his own role in society as a scholar and a citizen, with utmost seriousness.

More important is the fact that the results of contemporary sociobiological investigations even irrespective of their utilization in applied areas, have of themselves an impact on social consciousness. Jensen's position, therefore, is in no way convincing, because in the given case, it is not the practical uses of the findings, say, of research into genetic variance between races that are the object of ethical judgement, but the findings themselves and the way they are interpreted, especially in publications intended

for a broad readership. Oversimplification and distortion unavoidable in such mass editions prove to be far from being innocent. Barbara B. Lloyd, a British researcher, writes that scientists enjoy authority in contemporary society and their views rank high in public opinion. Any oversimplification and distortion in presenting scientific theories and results add to their attractiveness in the eyes of the lay public, thus increasing their direct or indirect influence upon society. It is therefore necessary to be very careful when exposing scientific findings in popular form.[28]

It would not be correct to regard Jensen, Shockley, Eysenck and others who support the decisive role of hereditary factors in determining the intellectual variance between races, as convinced apologists of racism. Yet it is evident that racists may well use such research findings in their own interests. Thus, anyone who undertakes this ideologically acute problem without taking into consideration this possibility, would at least be acting rashly. One can hardly agree with Jensen's assertion that "in the sphere of social action, any theory, true or false, can be twisted to serve bad intentions"[29] and that therefore one should not bother about it.

Under these circumstances, even the purely technical question of how to present findings of sociobiological research, becomes filled with a certain ethical content. Let us take, for example, a few terms such as "mental abilities" and "level of intelligence". We see from the materials of various discussions that there is no unanimous opinion in the interpretation of these terms, and hence in the ques-

tion to what extent the tests determine the intelligence quotient (IQ) actually reveal mental abilities, and what they serve to measure in actual fact.

US researcher Douglas Lee Eckberg[30] notes that most of Jensen's critics overlook four fundamental reservations in his concept which are extremely controversial: (1) the tests constitute valid measures of human mental functioning; (2) intelligence is generally metric-linear in structure; (3) the IQ is essential for educational and economic achievement; (4) the degree to which the IQ is genetically inherited can be measured. Referring to the history of IQ tests Eckberg recalls that French psychologist Alfred Binet, who began studying mental abilities in the 1890s, searched for a one-dimensional scale of intelligence, which would enable one to distinguish between gifted and ordinary children. He arrived at the conclusion, however, that individuals differ from one another by a whole set of mental actions and that this qualitative variety is difficult to assess: indeed, "How can we measure the richness of inspiration, the accuracy of judgement, the ingenuity of the mind?" In 1905, nearly desperate because of his failure to find a general denominator, he proposed a purely pragmatic test to the local authorities according to which intelligence in children corresponded to the marks they were given by their teachers.*

Binet knew of the limited nature of his method. Yet his tests were immediately acclaimed and spread across the USA, and were even used to predict the children's future. At the same time, all attempts on his part to create a fundamental theory of intelligence went unnoticed. US psychologists, Henry Goddard and L.M. Terman, used the Binet scale to introduce the concept of the intelligence quotient derived from the division of the

* The test proposed by Binet was meant to identify children lagging behind in their mental development. A graded series of questions easy to answer for a normal child was suggested to each age group. The level of intelligence was assessed according to a child's ability to answer those questions. Thus, a normal child of eight can count back from 20 to 0 and name the date; a 12-year-old child can make up a sentence from several words specially put in a wrong order.

"mental age", determined by testing, by the actual age of the individual. They maintained that the quotient does not change during man's entire life-time. True, some US psychologists at that time vacillated between a one-dimensional and a composite definition of intelligence. Others, however, insisted that it should be one-dimensional, even though they could not come to agreement in respect to mental actions underlying the level of intelligence.

Thus, the actual mental abilities of an individual and his score in testing can be wide apart. The test measures those things which can be measured, i.e. an ability to provide correct answers to specific types of tasks; still, the question to what extent we can in general estimate man's intelligence in quantitative terms, seems extremely controversial, especially if "distinctions in intelligence among the races are fixed in qualitative rather than in quantitative terms reflecting the principles of mental organization".[31]

Soviet Academician D.K. Belyaev wrote in this connection: "One should clearly realize that the IQ characterizing the ability of the testee to solve a particular problem at a given moment reflects only some aspects of the psyche. If one interprets intelligence as an integral indicator of man's creative and moral potential, then the IQ by no means can be used to characterize it. Any form of man's creative, really intellectual, activity involves a vast number of not only emotional-psychological but even anatomophysiological properties, which testifies to the great complexity of this integral indicator of man's spirit."[32] Proceeding from this assumption, the following conclusion seems to be utterly unjustified: "There is not yet a clear idea about what mental abil-

ities are, and every scientist proposes his own definition of the concept, so it would be useful to temporarily regard mental abilities and the IQ as approximately the same."[33] This is not a solution to the problem at hand, but its further beclouding which is fraught with the danger that the results of measuring certain aspects of the intellect's functioning (i.e. valuable only within certain limits) in tackling definite types of experimental problems, would be identified with the characteristics of the intelligence and mental abilities of an individual or a social group as a whole.

Meanwhile, in the valid opinion of the Committee for National Intelligence Test under the US National Research Council, "Ability tests do not measure many things that are important to performance in school and at work. First, they focus on a limited number of cognitive skills... Second, ability tests do not for the most part attempt to assess things like motivation or creativity These limitations qualify the relationship between test performance and everyday behaviour."[34]

Approximately the same can be said about the dependability of tests to determine the IQ. US sociologist Dorothy McBride Kipnis thinks that the testing itself, aimed at bringing to light differences in mental abilities, presents considerable difficulty, because there is no reliable methods for carrying it out.[35] The procedure of ability testing is still being evolved to make it more objective, i.e. less hinging on the tester's subjective peculiarities, and more acceptable. The attempts to improve ability testing prove that there are certain doubts as to its being

absolutely dependable. It is highly improbable therefore, from the methodological point of view, that the following conclusion is justified: "The shape of the distribution [of intelligence] for the population in general ... remains roughly the same from generation to generation."[36] Indeed, to arrive at such a conclusion, ability testing should have been carried out by a single method on a mass scale at least for several consecutive decades; as it is, with the methods of testing changing all the time, the conclusion cannot be regarded as sufficiently convincing. Some 60 years ago, US columnist, Walter Lippmann, expressed his doubts concerning attempts to measure intelligence when there is no generally recognized definition of what it is and no reliable data on the nature of abilities subject to testing. Still, even today, the "understanding of the factors that influence scores remains seriously incomplete".[37] Doubts are also voiced concerning applicability and adequacy of tests to determine the intelligence quotient, elaborated within the framework of West European and US culture, in testing individuals brought up in alien cultural traditions. The point is that the problems suggested to the testee may prove to be very distant from those he actually faces in his everyday life, and they may therefore be beyond his scope of comprehension. Besides, he may fail to formulate his answer in accord with the conditions of the test. Finally, he may lack the motivation indispensable for cooperating with the tester. Specialists are well aware of all these difficulties, but laymen are often presented with only two rows of figures, which may lead to the con-

clusion that present-day science has firmly established mental superiority of one social group, or one race, or one nation over others.

Finally, let us point out one more circumstance, which is not as a rule given sufficient attention in publications on the results of sociobiological research. Inter-group, inter-racial and inter-ethnic distinctions registered in the course of such research are usually statistical, which makes it impossible to assess the intelligence of an individual taken separately; at best, only a suggestion of a lesser or greater probability can be formulated. However, in public opinion, this circumstance is not always duly emphasized, and there is no doubt that the scholars presenting their findings do share responsibility for that.

Thus, even simple information (a statement) about the results of sociobiological investigations is linked with a whole set of ethical problems. Jensen notes: "The real danger is ignorance, and not that further research will result eventually in one or another hypothesis becoming generally accepted by the scientific community."[38] A fairly significant point may be added: Incomplete and inexact knowledge, which tries to pass itself off as the final and irrevocable scientific truth (or which is taken as such by public opinion), presents no less a danger than ignorance.

The question of whether the sociobiological studies considered in this chapter are justified at all from the point of view of ethics, is the most controversial among those debated in Western literature today.

In his article, "Genetic Research on Human Mental Abilities: Ethical Issues", published in *The Humanist,* January 1972, Jensen writes, among other things, that as regards racial differences in ability and achievement, "serious consideration of whether genetic as well as environmental factors are involved has been taboo in academic, scientific, and intellectual circles in the United States".[39] This assertion, though, is rather dubious: in the work by Audrey Shuey, for example, the findings of 382 studies carried out before 1966 are summed up comparing the intelligence of the US white and black population – both children and grown-ups.[40] The impressive number of the studies mentioned is quite out of accord with the existence of any taboos in this area. Yet, as Jean-Pierre Hébert states in his book, *Race et intelligence*, many renowned scholars in the West are of the opinion that as far as racial stratification based on socio-economic factors exists, it is no use to debate whether there are psycho-genetic distinctions between races and that, moreover, in the present situation and given the present standard of knowledge, such studies should be banned in general.

Jensen, on the contrary, vigorously objects to this opinion: "I therefore completely reject the idea that we should cease to discover, to invent, and to know (in the scientific meaning of that term) merely because what we find could be misunderstood, misused, or put to evil and inhumane ends."[41] This position can be but classed as scientistic; still, it was widely spread among scholars at the time when they thought themselves to be representatives of "pure science", which has nothing to do with earthly, human problems. Regrettably, this thinking still finds support in the scientific community even today. The issue of the scientist's social responsibility is reduced to that "he must simply do his research as completely and carefully as he can, and report his methods, results, and conclusions as fully and accurately as possible. When speaking as a scientist, he should not introduce personal, social, religious, or political ideologies."[42]

Clearly, this position makes it possible to disregard the question of whether certain studies are justifiable or not. However, other questions also arise. First of all, in opposing racism as an ideology which preaches hatred or strives to preclude recognition

of equal rights and equal value of members of different races, Jensen himself, in conformity with his own words cited above, comes out as an ideologist, not a scientist. Why then should the reader agree with him, taking his findings for granted, and not with some ideologist of racism?

Jensen also asserts that "race differences and social class differences ... are essentially more a social problem than a scientific one".[43] Why is it then that he, proclaiming himself to be a scientist, undertakes this very problem, and not any other, a truly scientific one? It is because, as he himself says, these problems "are there, nevertheless, and society demands that they be dealt with in many spheres of public concern, and perhaps more in education than in anything else".[44] Thus, it becomes clear at last that in tackling these problems Jensen envisions a kind of social order. But even if we assume that he is not interested in what social forces have given him this social order (from his point of view, this is of no significance to a scientist), then how can he be sure that the social order he is fulfilling does not hail from racism which he opposes?

Moreover, the studies Jensen mentions are *socio*-biological, i.e. they deal with people, and their results in some way influence people's opinions and relations between them. This alone is enough to regard these studies as an object of ethical regulation, since the primary object of ethics is relations between people and the norms regulating these relations. One can find arguments to substantiate ethical neutrality in natural science studies, but in the case of research in social science, which produces

knowledge subsequently included in the context of social life and so becomes part of social consciousness, the validity of such arguments shrinks considerably.

From Jensen's point of view, the scientist is an expert. With respect to social practice, the knowledge he gleans is a means of neutral value, and only those who make the political decisions, i.e. determine the social goals to be attained by these neutral means, can make scientific knowledge serve evil or good purposes. The scientist is therefore responsible only for the means he proposes to be tested and proved to be reliable. This position, however, does not take into account a dialectical relationship between the means and goals in human activities. If a scientist in the role of an expert proposes a certain means for solving a social problem, he also to a certain degree predetermines the direction of the search for a possible decision. And this is to say that the scientist's activity is not to be reduced to the sphere of the means alone: it is also related to the sphere of formulating and attaining the goals which are pursued in social practice.

The scientist's involvement in the life and activities of society has also another side to it. The initial propositions and principles, by which he is guided while undertaking problems and carrying out investigations, are in some measure a product not only of his professional, but also of his social position, of that social and cultural environment in which he lives and works. This equally concerns research into social, class, racial and ethnic differences between people. It is not to say that studies in

this field cannot produce authentic results, or that the findings can be purposely misrepresented to promote the personal, group or ideological preferences of the researcher. Yet it is necessary to take into consideration the fact that there is a possibility that the researcher can accidentally or unconsciously introduce his own social principles and value orientations into the processes connected with the choice of problems, methods of research and interpretations of the results. In the case we are discussing, urgent social questions constitute the object of research; therefore, critical reflection directed at these principles and value orientations becomes essential both from the methodological and the ethical point of view.

The work by Jean-Pierre Hébert, *Race et intelligence,* may be cited as a fine example of how difficult it is to stick to an objective and unbiased stand in analyzing sociobiological problems. The authors – two geneticists, an ethician and a specialist in psychometry – wrote a book under a pseudonym, so that if discussion arises about the book, it would concern its essence and not turn into polemics with any specific persons. They saw their task in the summing up of the information, including hypotheses and debates, on the problem "The Race and Mental Development", available in the mid-1970s. To solve their task, they had to take a critical view of all opinions on the problem at hand. However, as you read the book, you cannot but notice a systematic error unconsciously committed by the authors. In particular, in considering and comparing the views of those who favour the decisive role played by biology (heredity) and by the environment (social and cultural) in the development of intelligence, they always emphasize the methodological miscalculations of those researchers who maintain the latter point of view and deal much more gently with the argumentation and data presented by the supporters of the hereditary determination of intelligence. Thus, they write that whereas the proponents of

the heredity theory consider the possibility of a partial influence of the environment on racial differences, the adherents of the environment theory negate the role of genetic factors off hand. However, actually none of the supporters of either theory reason in such a one-sided manner, on the exclusive principle. All recognize to a certain degree the influence of both heredity and the environment. It would seem strange, indeed, if all proponents of the theory of the environment, among whom we find outstanding geneticists, completely rejected the role played by genetic factors.

The bias typical of the authors of *Race et intelligence* can be illustrated by the following example: in presenting the views of one of the scholars whom they listed among supporters of the environment theory—US geneticist, Richard Lewontin, they write that he is not convinced the exact measure of influence of heredity and the environment on the development of intelligence can be established. However, in their opinion, this refers to the method of research rather than the essence of the question.[45] It seems hardly probable that the essence of the question can be approached without a methodologically substantiated research procedure. On the other hand, Jensen's work is presented as a fundamental study in which he proved, drawing on vast factual and experimental material, the primary importance of heredity in the development of mental abilities.[46] In this particular case, the authors have no doubts about the material's validity and sound substantiation. Yet the fact that each side in the debate cites its own results of research and relies on its own factual and experimental material, reveals that the crux of the matter is not only in the empirical data as such but, to a great degree, in the researchers' point of departure, in their value orientations and social principles.

We have to add a few words about the arguments of US sociologist, Christopher Jencks, presented in his article, "Heredity, Environment, and Public Policy Reconsidered"[47] that those who are busy assessing the heritability of human properties almost always make distinctions between those undergoing the testing, by the racial principle, and many of them, even by the sexual principle. But why do the supporters of the heredity theory place such inordinate emphasis on race and sex? Why do they not consider these traits along with other genetic sources of the phenotype (i.e. pertaining to the organ-

ism's traits) variability? Indeed, variants of the heritability quotient may also be observed in groups identified by other principles. One may study heritability in comparing rural and urban environment, persons with a low or high socio-economic status. Generally speaking, there are no theoretical grounds for expecting the same degree of heritability in any pair of the subgroups.

Evidently, the choice of problems and the object of research is conditioned by social reasons at least to no smaller degree than by reasons of a purely scientific nature.

Thus, the freedom of research about which Jensen speaks proves to be not unconditional at all, since even the choosing of problems for research depends on the scientist's involvement in social life.

In the opinion of British researcher, Barbara B. Lloyd, who is concerned particularly with the difference between man and woman, "conventional ideology in our society holds that the scientist, guided by his conscience, is free to study those problems which he finds interesting, to employ the methods he believes most adequate and to report his results in the terms which he considers most illuminating. That this freedom can be constrained is seen when considering the changes in attitude which have taken place in the last few decades, both in the scientific community and the general public, towards the study of sexuability... Social constraints will be considered both as they affect the definition of sex differences and the data which are reported."[48]

Jensen's words to the effect that the knowledge gained "makes possible greater freedom of choice" which "is a necessary condition for human freedom in the fullest sense",[49] should be referred to that knowledge of social conditions and methodological substantiation of research activities which is simply ignored by the scientistic position held by Jensen. In

this case, we should also recognize that freedom of research is connected with a responsible attitude to one's own activity, its principles, results and effects, for, in recognizing that the researcher's work is socially substantiated and socially mediated, we also recognize that it is subject to ethical evaluation, ethical control and regulation.

Such regulation must not by any means assume the form of bans imposed on certain lines of research: it is simply impossible to ban or stop the investigation of genetically predetermined distinctions between races, since it is conducted on a broad scale now. The extreme position of those insisting on the ban, just as the position of the advocates of absolute freedom of research into any sphere at all, is not impeccable in ethical terms. Recognition of genetically predetermined distinctions between people, including differences of mental properties, has nothing to do with biologism, racism or elitism. In the words of D.K. Belyaev, "The hereditary quality difference between people, and hence their various inclinations and motives, present serious tasks to society in elaborating measures and programmes of non-standard upbringing and education. Yet these concerns are fully justified, because, given the vast diversity of trades, all men endowed with a widely varying measure of genetically predetermined individual properties, can attain a high degree of social, professional and moral perfection, provided adequate conditions of life, upbringing and education."[50] Belyaev particularly emphasized one circumstance which is usually ignored by Western scholars – man's inner potential for self-educa-

tion and self-development. The ban on investigations, among other things, would preclude obtaining knowledge necessary for undertaking social measures aimed at smoothing out manifestations of genetic distinctions on the phenotype level. As we have seen, however, ethical problems of sociobiological research are not to be reduced to the question of whether it should be banned or allowed. The argument itself, i.e. the estimation of scientists' ethical position, has become an important component of such research.

Free reference to the authority of genetics is a distinctive feature of the current discussions on sociobiological problems, in particular on those pertaining to hereditary predetermination of mental abilities. Jensen, for one, frankly calls his conception "a genetic concept of man" and accuses his opponents of not being aware of, ignoring, or distorting the results obtained and the methods used in contemporary genetics. Some of his opponents – supporters of social elitism and racism – deny the uniqueness of every individual, maintaining that his mental capacity is predetermined exclusively by his social, class or racial origin. Others – adherents of the environment theory – explain everything by the impact of the environment and in the final account also deny the unique nature of each human personality.

According to Jensen, "The antidote to both is to think genetically, that is ... in ways that are consistent with already well-established modern principles of genetics... It means that you and everyone else ... are genetically unique... Parents do not transmit their own genotypes to their offspring, but only their genes, and a random selection of only one half of them at that. Each

offspring is a new assortment, a new combination of genetic material."[51] Hence, in Jensen's opinion, man's behavioural characteristics are predetermined by his genotype. But will man radically change his view of himself if he learns that his entire behaviour does not depend on his environment, race or class origin, but is predetermined by a combination of genes? Indeed, in this case he is bound to see himself as a kind of automaton, which is strictly programmed, even if it is unique and exceptional. Yet it is commonly known from contemporary genetics that it is not a particular reaction, but the norm, i.e. a definite scope of reacting to the impact of the environment, that is inherited, so that the final result of development is determined by precisely the genotype-environment interaction. This is what Theodosius Dobzhansky, an outstanding geneticist, has to say on the subject: "What, then, is the meaning of the often-heard statement that the intelligence of a person is determined by his genes?... The genes have determined the intelligence (or stature or weight) of a person only in the particular sequence of environments to which that person has been exposed in his upbringing and life experience. What actually develops is conditioned by the interplay of the genes with the environment."[52]

As we see, the strict programming or predetermination of man's individual features is denied here. Thus, the question inevitably arises, to what extent is the "genetic concept of man", proposed by Jensen, actually genetic and scientific?

The difference between these positions can be clarified by the following example. It is no secret that phenylketonuria is a grave hereditary disease; as distinct from mental abilities, which are genetically predetermined, according to some estimates, by 65-80 per cent, this disease is 100 per cent genetic. Today, however, if diagnosed early enough, the gene causing the disease can be neutralized by prescribing a definite diet, so that it is not manifested in the phenotype. Thus, even a genetically

predetermined trait is not manifested under certain conditions of the environment.

As for man's mental abilities, the impact of the environment on them is much more variegated, and its interaction with the genotype can hardly be denied. We have already noted the absence of the generally accepted interpretation of the intellect; as for genetic mechanisms which predetermine mental abilities, contemporary genetics is practically unable to pronounce any verdict. The question of what the IQ is from the point of view of the genetic mechanisms of heredity remains unanswered. Thus, it is impossible to say anything definite about the environmental factors exerting an influence on this quotient, and what this influence amounts to.

Of certain interest in this connection is the position of Christopher Jencks in his article, "Heredity, Environment, and Public Policy Reconsidered", which we already mentioned. He notes that in the current discussions of the heredity-environment question, genetic effects are unconsciously identified with physical, and non-genetic effects, with social ones. Actually, the inner sources of distinctions can be both genetic and non-genetic, and the external sources—either physical or social. Jencks states that supporters of the heredity theory think that manifestations of genetically predetermined properties are mediated only by physical causes, while supporters of the environment theory, on the contrary, maintain that the genetically predetermined inclinations are mediated in their manifestation by social factors alone. He illustrates his assertion with the following example: Debates about distinctions between men and women connected with their respective success in the sphere of mathematics can usually be reduced to the discussion on whether distinctions in the successes scored by men and women in mathematics are due to "genetic" or "environmental" reasons. From the point of view of population genetics, however, these distinctions are genetic by definition. The individuals in-

heriting two X-chromosomes (women) differ from the individuals who inherit one X-chromosome (men). Yet supporters of the heredity theory insist that this difference in the number of the chromosomes produces innate physiological distinctions which tell on the behaviour, while supporters of the environment theory hold that the same chromosome difference causes visible outward distinctions, which make society take a different view of individuals of different sexes.

The same is true of racial distinctions in the estimation of the IQ. Adherents of the heredity theory assert that the genes responsible for the colour of the skin and facial features have a direct impact on the central nervous system and brain or cooperate with other genes in exerting that impact, while adherents of the environment theory are of the opinion that the colour of the skin and facial features determine the racial affiliation of the individual, and that is decisive in how society looks upon him, and in his own concept of himself.[53]

Thus, even if we recognize genetic distinctions in the races and the fact that they are reflected in the estimates of the IQ (here it is relevant to remind the reader once again that the IQ is not to be identified with the general characteristics of man's mental abilities), still we cannot say anything definite about how this dependence is determined. Since our knowledge about the mechanism by which the phenotype manifestation of the gene operation occurs is very poor, we can hardly be expected to say anything definite about the share of biological (genetic) and social factors involved.

The fact that attempts made in the USA to smooth out the difference in the IQ between different races through the introduction of mixed general education schools for children of different races have not produced any tangible result, cannot prove anything either. However, it is precisely this fact that

stirred up public interest in the problem and has become one of the chief arguments used by supporters of "genetic determinism". As it is, however, the failure of these efforts can in equal measure testify to either predominantly biological or predominantly social predetermination of the IQ.

Many questions arise in connection with investigations into the relationships existing between the socio-economic status of individuals and groups, and their IQ, and in particular in connection with the interpretation of their findings. Sometimes, the scientists who have obtained more or less similar results express opposite opinions. Jensen, for example, says that "the evidence on the heritability of individual differences in intelligence ... is among the most consistent and firmly established research findings in the fields of psychology and genetics".[54] And A.H. Halsey, on the contrary, writes: "From a consideration of the small reduction in the variance of measured intelligence which results from classifying children according to paternal occupation, it seems reasonable to conclude that the observed differences between social classes in measured intelligence are more likely to be explained by environmental rather than genetic factors."[55] Thus, we see that the divergence in the conclusions concerns the fundamental question which is a primary purpose of such investigations.

Considerable variance of opinion can also be found in respect to initial assumptions of the investigators. All rely on distinguishing between two models: a "caste society", in which migration of individuals among different social groups is excluded

and the socio-economic status of the individual is fully predetermined by his origin, and an "open class society", in which the socio-economic status depends on the individual's mental abilities and there is an opportunity of moving from one social group to another. In conformity with the model of a "caste society", each caste is a genetically closed population, whereas a class society is not characterized by such a closed nature.

Jensen states that distinctions between the castes can be eradicated in a caste society over several generations. Halsey, on the contrary, claims that the distribution of inborn intelligence between the castes in a caste society will remain the same. Hence, the fundamental difference of opinion, in effect opposition, in the explanation of how the correspondence between the high social status and high IQ marks is achieved in a society of high social mobility. Jensen explains this by the fact that marriages mostly occur between partners possessing similar personalities, professional and educational parameters. Thus, given high social mobility, the genes are sorted out. This leads to a much greater intellectual inequality between groups of people with different socio-economic status than under the conditions of a caste society. As for Halsey, he thinks that genetic exchange between various socio-economic groups, on the contrary, only serves to consolidate the balance existing between their intellectual levels, i.e. high social mobility does not serve to increase intellectual distinctions.

Remarkably, both authors arrive at such different conclusions while proceeding from approximately the same interpretation of a class society. Halsey states that in the class society model, the starting point is recognition of the fact that an individual's social status is determined by his mental abilities, while Jensen holds that in a society with high social mobility, the more gifted of its members strive to move on to a higher rung, while the less gifted try to occupy the lower levels in the socio-economic hierarchy. Let us leave aside Jensen's highly-doubtful assertion that whole sections of society are busy trying to occupy

the lower levels of the social hierarchy, and turn our attention to the agreement of the two authors concerning the fact that high giftedness results in a higher socio-economic status. Other authors concerned with the same problem share this viewpoint. Thus, the authors of the *Race et intelligence* claim that social mobility is ensured by the social advance of talented members of the "lower classes" and the descending of the social ladder by non-talented members of the higher classes.[56]

As seen from the above review of literature, all authors – supporters of both the heredity theory and of the environment theory – are equally convinced that in a society with high social mobility (i.e. in modern Western society, to judge by the countries where the cited data was obtained), there is a direct link between the level of mental abilities (to be more exact, the IQ) and the socio-economic status. In a word, modern bourgeois society is a meritocracy characterized by the power of the most worthy members. We cannot agree with this point of view, however. Of course, Theodosius Dobzhansky writes, "members of privileged classes like to believe that everybody belongs to the socio-economic class for which his genes qualify him".[57] Members of other classes, however, may hold to a quite different opinion. As for the data presented, its interpretation seems to us faulty and specially employed to serve the interests of elitism and racism.

For example, the above-mentioned investigations establish a correspondence between the IQ and the social status. Yet one should not draw a hasty conclusion about an immediate dependence of the status on the IQ, since there can also be a reverse dependence: persons with a higher status

enjoy greater social opportunities for improving their IQ. Besides, the given data should not be raised to an absolute. Indeed, it would have been much more valid if it had been compared with the data on the correspondence between the socio-economic status and other variables such as, for example, the socio-economic status of the particular individual's parents or the level of their income. If the correspondence according to these variables proves to be higher, that will testify to the fact that in an "open society", too, far from everything hinges on mental abilities. The very choice of the IQ parameter as the only determinant of the status, betrays the authors' bias and proves that they proceed—consciously or unconsciously—from quite definite ideological positions. Though this approach cannot be called pure biologicization because some of its apologists preach the environment theory, there is a distinct echo of social-Darwinism in it, with its thesis on selection—whether biological or social—as the decisive factor in the formation of society's socio-class structure.

Another circumstance also deserves a comment. All authors, who are concerned with the problems of dependence of the socio-economic status on the IQ, hold it as a self-evident truth that a person endowed with high intelligence passionately strives to attain as high socio-economic status as he can. In actual fact, however, such a person may well be inclined towards achieving quite different goals. Of course, if this type of behaviour is not widely spread, it may be disregarded in statistical studies. Still, the absolute nature of the value system, according to

which attainment of as high socio-economic status as possible is the basic vital stimulus in the life of man in the West, should be questioned if we only recall such social movements as the student unrest in the late 1960s, the hippies and various forms of escapism. Therefore, it is clear that the behaviour diverging from the stereotype is seen as anomalous by supporters of the status's dependence on the IQ; it is also clear that the investigations themselves, irrespective of their findings, serve to reproduce and consolidate the stereotype, reducing the real opportunities and narrowing down the spheres of realization of the human personality—and all this is imbued with certain ideological and socio-ethical significance.

The British sociologist of science Jonathan Harwood notes the fact that, despite wide application of IQ testing in the practice of education and bringing to light professional fitness, US psychologists failed to construct special tests for revealing specific abilities necessary in school, in military service, or in industry. Such tests, however, could help elaborate a multidimensional concept of intelligence. Harwood notes that such a complex concept of intelligence would undermine the meritocratic concept of the hierarchy of ranks that differ only in the quantitative aspect of intelligence required by each rank. The need for testing to determine educational abilities or abilities indispensable to fill certain posts, did not stimulate the development of tests to reveal specific talents. Testing was in fact used not to disclose professional inclinations (for that, the IQ tests are too crude), but to regulate access to privileges. In Harwood's words, "many selective American universities rely substantially upon mental ability test scores in their admission procedures, even though it is well-known that such scores are poor predictors of academic achievement or subsequent professional excellence".[58]

Investigations examined in this chapter, as a rule, pursue a certain practical goal. This refers both to the study of age distinctions and their impact on creativity, and to the questions of intelligence distinctions between men and women and members of different socio-economic and racial-ethnic groups. As is well-known, results obtained in applied research are estimated not only from the angle of their authenticity, but also from the angle of their efficiency, and the latter estimate is often decisive. For example, if in the course of such an investigation, a certain empirical dependence is revealed, which makes it possible to resolve technical tasks of a certain class, this dependence can be used in practice irrespective of whether it has been theoretically grounded or not.

The situation is about the same in research concerning genetic distinctions between people and social groups, and relying on their IQ. As already noted, to theoretically substantiate these distinctions, a much higher level of knowledge is required of the mechanisms of the genes' functioning and manifestation. This demand greatly increases the responsibility of those scientists who carry out such investigations, interpret and publicize the results obtained, since the information, for example, on age distinctions in creativity can be used by decision-makers as regards jobs or concluding contracts for research with scientists. That is to say, such information will have practical impact irrespective of its truthfulness or scientific validity. In point of fact, it is of a statistical nature and, strictly speaking, cannot be applied without reservations to a concrete in-

dividual of a certain age, sex, social status and ethnic affiliation. However, two circumstances should be taken into consideration. First, this information will have an effect upon the impression made by a particular individual on the decision-maker during their first meeting. Second, let us assume that the decision-maker is well aware of the statistical nature of the data on age productivity and will also take into account this individual's IQ score. In the eyes of the person making decisions this estimate, especially if it corresponds to the statistical data at his disposal, looks like an objective characteristic. Yet the IQ score is but a conditional index, and the fact that in this particular case it is confirmed by statistical data does not make it any more reliable.

> In the report of the Committee on Ability Testing, it is noted that test scores, like all data, have limited dependability and significance but are often used as if they were meaningful everywhere and forever. People who rely on test data as sufficient in themselves often oversimplify even more drastically by using a test score as a label rather than as a summary of the information the test was constructed to provide. In the course of its investigation, the Committee has seen enough instances of these kinds of misuse of test scores to conclude that overreliance on test scores is a widespread problem.[59]

One may conclude from the above that the information presented on the results of a sociobiological study, since it concerns relations between people and exerts an influence upon them, is by no means neutral in ethical terms. This is also revealed in the discussions on ethical problems involved in choos-

ing themes for research, conducting sociobiological studies, interpreting the results obtained and publicizing relevant information.

Today, no more or less serious scientific research is undertaken without it being previously substantiated in methodological terms; the degree of reliability of the results obtained is usually associated with the soundness of the methods used. Debates on ethical problems of science which assume an increasingly acute character and in which an ever greater number of scientists take part, testify to the fact that in many cases it is vitally important to *ethically* substantiate the contemplated scientific investigation.

If we take into account that the social functions of science are expanding and that its practical uses and the social effects of scientific and technological progress are extremely variegated, it becomes clear that neither universal and therefore abstract ethical estimates of the development of science as a whole nor the socio-ethical analysis of the already accomplished research are sufficient. Naturally, analysis of ethical questions involved in scientific research far from always produces definite results. Still, it is important even if it merely instigates interest in discussing such problems. And the more serious the attention given to the ethical substantiation of scientific research, the more likely the opportunity for timely revealing and neutralizing the possible negative effects of scientific and technological progress, and for progressive circles in the scientific community opposing anti-humane utilization of scientific achievements. This increasingly refers to the

scientific knowledge of life and man, including investigations carried out within the framework of human genetics for the prospect of applying, for example, cloning and genetic engineering. Socio-ethical problems and discussions arising in this connection must be given close attention, because in many instances they reveal the same social-biologism, only clad in new attire (in particular, a neo-eugenic one). At the same time, numerous new and complicated questions arise which require in-depth analysis from the positions of genuine humanism.

NOTES

[1]The postulates and methodological substantiation of social-biologism are exposed in: I.T. Frolov, *The Prospects for Man*, Moscow, 1983 (in Russian).

[2]See P.A. Kropotkin, *Ethics*, Vol. 1, *The Roots and Evolution of Ethics*, St. Petersburg, Moscow, 1922 (in Russian).

[3]Ernst Haeckel, *Die Lebenswunder. Gemeinverständliche Studien an der biologische Philosophie*, Alfred Kröner Verlag, Stuttgart, 1904, pp. 449-50.

[4]*Biology and Ethics*, Proceedings of a Symposium Held at the Royal Geographical Society, London, on 26 and 27 September 1968, Edited by F.J. Ebling, Academic Press, London, 1969.

[5]Ibid., pp. XV, XVI, XXVI, XXVII.

[6]Ibid., p. 7.

[7]Ibid., p. 21.

[8]Edward O. Wilson, *Sociobiology. The New Synthesis*, The Belknap Press of Harvard University Press, Cambridge, Massachusetts, 1975, p. 547.

[9]Ibid., p. 562.

[10]Richard Dawkins, *The Selfish Gene*, Oxford University Press, Oxford, 1977.

[11]Julian Huxley, *The Human Crisis,* University of Washington Press, Seattle, 1963; idem, *Essays of a Humanist,* Penguin Books, Harmondsworth, Middlesex, 1964.

[12]Frederick Engels, *Anti-Dühring,* Progress Publishers, Moscow, 1975, p. 118.

[13]V.I. Lenin, "Materialism and Empirio-Criticism", *Collected Works,* Vol. 14, 1962, p. 328.

[14]Charles J. Lumsden and Edward O. Wilson, *Genes, Mind, and Culture. The Coevolutionary Process,* Harvard University Press, Cambridge, Massachusetts, 1981.

[15]Charles J. Lumsden, Edward O. Wilson, *Promethean Fire. Reflections on the Origin of Mind,* Cambridge, Massachusetts, 1983.

[16]Lawrence M. Hinman, "The Ambiguity and Limits of a Sociobiological Ethics", in: *International Philosophical Quarterly,* Vol. XXIII, No. 1, March 1983, pp. 77-89.

[17]Richard C. Lewontin, Steven Rose, Leon J. Kamin, *Nous ne sommes pas programmés. Génétique, hérédité, idéologie,* Éditions La Decouverte, Paris, 1985.

[18]Ibid., p. 319.

[19]Ibid., p. 331.

[20]See: A.F. Shishkin, "Ethology and Ethics", in: *Voprosy filosofii,* No. 9, 1974. These ideas were summed up and developed by the same author in a book titled *Human Nature and Morality. A Historico-Critical Outline,* Moscow, 1979 (in Russian).

[21]V.P. Efroimson, "Genealogy of Altruism. A View of Ethics from Positions of Human Genetics", in: *Novy mir,* No. 10, 1971, p. 194.

[22]Ibid., p. 223.

[23]Amitai Etzioni, *Genetic Fix,* Macmillan Publishing Co., Inc., New York, 1973.

[24]*On Equality of Educational Opportunity,* ed. by Frederick Mosteller and Daniel P. Moynihan, Vintage Books, New York, 1972, p. 546.

[25]Amitai Etzioni, op. cit., pp. 21-22.

[26]Ibid., p. 24.

[27]Arthur R. Jensen, *Genetics and Education,* Methuen and Co., Ltd., London, 1972, p. 328.

[28]Barbara B. Lloyd, "Social Responsibility and Research on Sex Differences", in: *Exploring Sex Differences,* ed. by Barbara Lloyd, John Archer, Academic Press, London, 1976, p.18.

[29]Arthur R. Jensen, *Educability and Group Differences,* Harper and Row Publishers, New York, 1973, p. 17.

[30]Douglas Lee Eckberg, *Intelligence and Race. The Origins and Dimensions of the IQ Controversy,* Praeger Publishers, New York, 1979, p. 6.

[31]Jean-Pierre Hébert, *Race et intelligence,* Editions Copernic, Paris, 1977, pp. 147-48.

[32]D.K. Belyaev, "Contemporary Science and Problems of the Testing of Man", in: *Voprosy filosofii,* No. 3, 1981, p. 14.

[33]Jean-Pierre Hébert, op. cit., p. 164.

[34]*Ability Testing: Uses, Consequences, and Controversies,* Part I: Report of the Committee, ed. by Alexandra K. Vigdor and Wendell R. Garner, National Academy Press, Washington, 1982, p. 237.

[35]See: Dorothy McBride Kipnis, "Intelligence, Occupational Status, and Achievement Orientation, in: *Exploring Sex Differences.*

[36]M. Young and J. Gibson, "In Search of an Explanation of Social Mobility", in: *Heredity & Environment,* edited by A.H. Halsey, Methuen & Co. Ltd, London, 1977, p. 204.

[37]*Ability Testing: Uses, Consequences, and Controversies,* Part I, p. 214.

[38]Arthur R. Jensen, *Educability and Group Differences,* p. 17.

[39]Arthur R. Jensen, *Genetics and Education,* p. 328.

[40]See: Audrey M. Shuey, *The Testing of Negro Intelligence,* New York, 1966.

[41]Arthur R. Jensen, *Genetics and Education*, p. 327.

[42]Ibid., p. 328.

[43]Arthur R.Jensen, *Educability and Group Differences,* p. 16.

[44]Ibid.

[45]Jean-Pierre Hébert, *op. cit.,* p. 190.

[46]Ibid., p. 49.

[47]*American Sociological Review,* Vol. 45, No. 5, October 1980, pp. 723-36.

[48]Barbara B. Lloyd, op. cit., pp. 1, 2.

[49]Arthur R. Jensen, *Genetics and Education,* p. 327.

[50]D.K. Belyaev, op. cit., p. 16.

[51]Arthur R. Jensen, *Educability and Group Differences,* pp. 8, 9.

[52]Theodosius Dobzhansky, *Genetic Diversity and Human Equality*, Basic Books, Inc., Publishers, New York, 1973, pp. 7, 8.

[53]See: Christopher Jencks, op. cit., pp. 724, 730-31.

[54]Arthur R. Jensen, *Educability and Group Differences,* p. 156.

[55]A.H. Halsey, "Genetics, Social Structure and Intelligence", in: *Heredity & Environment,* p. 200.

[56]Jean-Pierre Hébert, op. cit., pp. 189-90.

[57]Theodosius Dobzhansky, op. cit., p. 26.

[58]Jonathan Harwood, "The IQ in History", in: *Social Studies of Science,* London, Vol. 13, No. 3, August 1983, p. 471. This problem is dealt with in detail also in: James M. Lawler, *IQ, Heritability and Racism,* International Publishers, New York, 1978.

[59]See: *Ability Testing,* Part I, p. 237.

CHAPTER 6

Ethical Problems of Human Genetics. Genetic Engineering: Unlimited Opportunities and Possible Restrictions. Freedom of Research and the Scientists' Socio-Ethical Responsibility

Ethical problems involved in scientific activities are today raised and discussed in the most acute form in connection with possible uses of advances in genetics, first of all, the genetics of man. This generalized concept includes several genetic disciplines of different profile, united by the common object of study—man. At present, there is a great number of investigations that analyze social, ethical and humanist problems of human genetics. Let us try to sum up the results of this analysis and supplement it with new data and considerations, taking into account the new situation that has developed in the given field of knowledge and in the discussions during recent years, in particular those devoted to the ethical aspects of genetic engineering and its possible application to man.

Let us recall some truly dramatic events which have taken place recently in genetic engineering and have given rise to heated debates on socio-ethical, humanist topics. What has provoked such great interest in the socio-ethical problems of genetic engineering and why has it become a central point at

which many lines of reasoning crossed and numerous discussions were initiated? This is explained by the fact that, in addition to a purely cognitive interest, genetic engineering immediately aroused interest in the opportunities of its practical application. Today, it is viewed as a model of fundamentally new technologies of the future, which will rely on advances in the biological science (in particular in biotechnology) to a much greater degree than contemporary technologies. The prospects opened up by genetic engineering in medicine and agriculture, and in different branches of the chemical industry are being widely discussed. That caused many scientists to ponder the problems involved in the social responsibility of science and the opportunities of social regulation — both "internal" and "external" — of scientific research. Finally, broad public circles, and in some cases even governmental agencies and legislative bodies, have also been drawn into discussions on problems related to genetic engineering.

Not so long ago, as a result of the emergence and development of cybernetics, public attention was glued to issues involved in management, in particular to the fact that in managerial processes, energy transformations of enormous power can be regulated and controlled by means of weak-powered signals. Genetics faces approximately the same problems, for it studies the structures and mechanisms governing the processes underlying the growth and development of biological organisms. As for genetic engineering, it sets itself the task of making it possible for man to directly interfere into these processes by restructuring organisms' genetic programme in the

way he chooses. In this case, minutest changes occurring at the level of the microstructure of individual cells can produce considerable effects at the macro-level of the organism, whole populations and even the entire biosphere. Thus man assumes enormous power, and that power should be used with circumspection and greatest caution – this, in the final analysis, is the socio-ethical content of investigations in the field of genetic engineering.

The British novelist, Aldous Huxley, who was interested in the influence scientific development exerts on man, was probably the first to pay attention to dangerous consequences that may be produced by interference into human genetics in his anti-utopian novel of fantasy, *Brave New World* (1932). In 1946, in his Foreword to one of the book's new editions, Huxley wrote: "It is only by means of the sciences of life that the quality of life can be radically changed. The sciences of matter can be applied in such a way that they will destroy life or make the living of it impossibly complex and uncomfortable; but, unless used as instruments by the biologists and psychologists, they can do nothing to modify the natural forms and expressions of life itself."[1] These words of Huxley come to mind in connection with certain developments in the field of genetic engineering.

It is generally accepted that genetic engineering emerged in the early 1970s, when a group of scientists at Stanford University (USA), led by Paul Berg, who was subsequently awarded a Nobel Prize, developed a method of constructing hybrid DNA molecules. The hybrids of molecules of the tumo-

rigenic SV40 virus and adenovirus molecules had been revealed in the course of experiments staged by virologist R.H. Hupner and medical worker Andrew M. Lewis in the laboratory of the National Institute of Allergy and Infectious Diseases (USA) as far back as in the 1960s. As distinct from the SV40 virus, causing tumoral infection in monkeys, the hybrid molecules were also capable of reproduction in human cells. In other words, it was discovered that the biocombination performed in laboratory conditions may prove to be a new pathogene charged with an unprecedented danger to the human organism.

The method elaborated by Berg made it possible to construct hybrid molecules consisting of a segment of the bacterial virus (bacteriophage lambda), to which bacterial genes were added coding the enzyme necessary to synthesize galactose and the SV40 virus. It was supposed that, as it is introduced into a bacterial or animal cell, such a molecule may cause a tumoral disease in its receptor. The method was based on the use of enzymes making it possible first, to split DNA molecules in strictly definite places and, second, to splice certain DNA sections into a single whole. Genetic engineering is a system of experimental methods, allowing to create artificial gene structures which are called recombinant (hybrid) DNA molecules.

As he analyzed the developments leading to the emergence of genetic engineering, Academician A.A. Bayev (USSR Academy of Sciences) noted that it "has not brought in its wake a new vision of biological phenomena, new cognitive ideas or the need to destroy the existing notions... Both the in-

terpretation of the nature of heredity and its problems remained intact; what underwent a radical change was the possibility to penetrate to the very core of phenomena: it was as if a key was found to a firmly locked door, so that for a time scientific research was granted freedom in its progressive movement. One has only to marvel at the fact that this relatively insignificant step forward in methodology, i.e. the discovery and application ... of splitting and ligating enzymes, has led to a wonderful expansion of experimental opportunities."[2]

Let us once again recall that there is a dialectical relationship between the goals and means in human activities. The appearance of a new means of exerting an experimental and practical impact on the structures which direct the organism's growth and evolution, makes it possible to set a whole spectrum of new goals that have become feasible or at least attainable in the more or less distant future. Many of these goals require discussion not only in respect to their practical realization, but also as regards their socio-ethical justification. However, the matter is not to be reduced to this, since the evolution of genetic engineering placed on the agenda the question of the ethical regulation of experimental activities in general.

The prospects opened up by genetic engineering are dual indeed. With its help mankind can, or will be able to in the nearest future, obtain unlimited quantities of medicines (such as insulin, human hormone of growth, interferon, many antibiotics), which are now in short supply. The method used in this science will help to put into life the cherished

dream of plant-growers by rendering such properties to agricultural plants that will make them resistant to disease and parasites, frosts and drought, and will enable them to absorb nitrogen directly from the air, so that expensive nitrogen fertilizer can be dispensed with. Finally, it is genetic engineering that can absolve people from inborn diseases by substituting normal for pathogenic genes. Many laboratories the world over have already started work to find ways of applying genetic engineering methods in the food and chemical industries.

In a very short time, genetic engineering began to be used in practice, in particular, in industry. As a rule, results obtained in basic research are applied only many years later, but in the case of genetic engineering, in Academician Bayev's estimate, it has been a matter of not more than a decade. The DNA industry has already made its appearance on the scene: since 1976, firms began to be established in the USA, France, Britain, Japan, Switzerland and other countries which develop production processes based on genetic technology. Between 1976 and 1985, over one hundred of these firms were founded.[3] According to another source of information, in the period from 1979 to 1981, one hundred and fifty biotechnology companies sprang up.[4] As Sheldon Krimsky noted,[5] in 1980, the combined capital of four leading firms in the field of genetic engineering (Cetus, Genentech, Biogen, and Genex) exceeded 500 million dollars. Possibilities offered by genetic engineering both in fundamental science and in many other fields, and in particular its applications, are really unlimited. Much is at

present written about these possibilities. Regrettably, sometimes prognoses are made which are not always scientifically valid and circumspect, ànd the dangers mankind is bound to face are far from always fully realized.

It is vitally important to pay attention to another aspect of genetic engineering, i.e. its potential threat to man and humanity as a whole. Indeed, since manipulations underlying its methodology involve the most intimate mechanisms of self-governed genetic processes and in the final analysis life itself, it is clear that molecular biologists have arrived at the very brink of the experimental abyss. Even a small error made by an experimenter, or his incompetence in safety precautions may lead to irrevocable consequences that would present a serious threat to humanity as a whole.

The danger increases many times over if this technique falls into the hands of some kind of malefactors and is applied with criminal intentions or for military purposes. The global nature of this danger is primarily rooted in the fact that organisms, which are as a rule experimented on, are widely spread in nature and are capable of exchanging genetic information with their "wild" relations. The problem assumes exceptional importance because these kinds of manipulations can result in creating organisms with entirely new genetic properties yet unknown on Earth and not developed through evolution. Thus, the consequences of such experiments are impossible to predict.

All these considerations have caused serious concern among the progressive scientific community

and have given rise to heated discussions on the possibilities and conditions for carrying out experiments in genetic engineering. The great interest in the debates was largely due to the social context in which experiments with recombinant DNA were undertaken, in particular in the USA. In those years the public there employed extremely diversified forms to express its protest against the "dirty war" in Vietnam. Associations of scientists took part in the anti-war movement, convinced that it was necessary to prevent the application of the results of their investigations in that war.

The atmosphere in the country was made even more explosive as a result of mass student action and unrest on University campuses. The issues of the scientists' social responsibility, whom should science serve and in whose service it really is, were also prominent in these movements. Sheldon Krimsky, for example, wrote in his book, *Genetic Alchemy,* that some participants in the DNA debate "have drawn explicit parallels between the gene-splicing technology and the early years of the application of atomic energy. The secrecy shrouding the development of a nuclear arsenal was a great source of guilt and embarrassment to some members of the scientific establishment. Henceforth, that period became an effective reference point for looking at policy issues involving the use of DNA technology."[6]

The debate mostly concerned two problems—that of the potential danger of experimenting with hybrid molecules, and a more general problem of the possible social consequences of practical applications of genetic engineering.

The debate was initiated by some researchers expressing their apprehensions in connection with a plan to carry out a series of experiments on introducing the cancer SV40 virus which causes tumours in mice and hamsters, into the bacterium of colibacillus permanently residing in man's intestines. Neither that virus nor the bacterium present any danger to man in their natural state. The scientific community was concerned that the day may come when the bacterium would be taken beyond the experimental installation and out of the laboratory walls and would bring its cancer load into man's living cell. That is why Paul Berg, whose laboratory was scheduled to carry out the experiments, decided to hold off this work for some time. The scientists' attempts to estimate the probability of a "cancer epidemic" failed for lack of relevant information.

In 1974, a group of researchers led by Paul Berg called on the scientists of the world to work for a moratorium on scientific investigations in two most dangerous lines of research and, if necessary, to convene an international conference. They proposed that scientists refrain from experiments in splicing the genes coding the factors of resistance to antibiotics and the genes coding toxins, by bacterial plasmids.* They also proposed that experiments be not conducted in ligating DNA segments of oncogenic and other animal viruses, because scientists possess no knowledge of whether the given viruses may be tumorigenic. In addition to abstaining from these two types of experiment, it was also recommended that scientists be particularly careful in conducting "drummer experiments", whose essence consists in random binding various DNA segments of animals to a bacterial plasmid and in introducing this plasmid into a bacterium. These kinds of experiments were viewed as dangerous since many types of animal DNA contain sequences of nucleotides similar to oncogenic viruses.

The passionate appeal to the scientific community concerning the self-regulation of scientific activities, met with support from many scholars throughout the world. A Study Committee on Genetic Engineering was set up in Britain. As a result of its activities, the British Medical Research Council issued a ban

* Plasmids are circular DNA structures situated outside the chromosomes and can be bound with a bacterium and multiply within the cell of the recipient.

on these kinds of experiment. The appeal of the researchers to their colleagues to temporarily refrain from highly promising investigations in a rapidly developing field of knowledge, had no precedent. (In this connection we should recall the address of a group of nuclear physicists led by Leo Szillard. At that time, though, it only referred to imposing restrictions on publishing the results of research, not on research itself.) A year later, Paul Berg wrote that in calling for a moratorium, the authors of the appeal did not think of the scientists' social responsibility: "We just felt this was a way of telling other people the way we felt about it and asking them to think about it and hold off."[7]

In his comment on this appeal, Academician W.A. Engelhardt wrote: "It is difficult to say whether all the motives which prompted such an appeal are reflected in the text. One thing is certain – ... drawing such great attention to the problems mentioned in the scientists' appeal is very urgent and vitally important... Today it is clearly manifest that the main threat is not contained in the experiments as such, but in their becoming an object of manipulation in the hands of light-minded, irresponsible people, or even in the hands of ill-intentioned elements. It is against these hazards that efforts should primarily be directed."[8]

The appeal for a moratorium met with an unprecedented response among wide sectors of the public. US authors, William Bennett and Joel Gurin, wrote that for the first time in the history of science, an issue of purely scientific nature, bearing not on the problems of utilizing scientific achievements but on the feasibility and justification of continuing research in the given direction, was made the subject of a wide debate.[9] Both in the USA and Britain, publications appeared to the effect that if even scholars

themselves decided to stop certain lines of investigations, then all research into genetic engineering must be extremely dangerous.

It is maintained that the moratorium was observed over eight months, up to late February 1975, when an International Conference on Recombinant DNA Molecules was held in Asilomar (Pacific Grove, California), in which 140 scholars from 17 countries, including the Soviet Union, participated. They summed up advances in studying recombinant DNA molecules, discussed certain social and ethical problems related to experimentation in genetic engineering, the ways to avert the potential biological danger involved in this work, and conditions for the lifting of the voluntarily imposed moratorium on the two kinds of the most dangerous experiments. The general spirit of the conference was that scientists were to make a decision that would be bound to have an impact on the policies in the sphere of science, the money allocations for scientific research and further development of genetic engineering. Because of the great interest shown in the issue under consideration by both public and government circles, to recognize that certain experiments were dangerous would be tantamount to worsening the conditions of research and even to terminating certain lines of research which were of certain scientific value. Describing the way scholars behaved at the conference, Berg noted that each tried to draw a magic circle around his own research problem and to depict it as "purely scientific" and "safe", while proving that the danger existed elsewhere, in the investigations of others.

In its comment on the results of the Asilomar conference, *Science* magazine wrote: "Like the moratorium that preceded it, the conference's statement has the power of moral censure only, but the guidelines it proposes will probably be followed closely by the national bodies in each country responsible for framing the relevant regulations. Just as the moratorium seems to be unprecedented in the history of science, the action of the conference is a rare, if not unique, example of safety precautions being imposed on a technical development before, instead of after, the first occurrence of the hazard being guarded against. The conference's decisions were reached in the explicit

awareness that ... if the scientists present failed to regulate themselves in an evidently disinterested manner, others would do so for them."[10] According to *Science,* the chief opponents to the organizing committee at the conference were James Watson and Joshua Lederberg, both of them Nobel Prize winners. They diligently searched for faults in the committee's recommendations, and, though they had no joint strategy, they succeeded in bringing discord into the ranks of young scientists who were impatient to put an end to the moratorium on the easiest possible conditions. Lederberg attacked a document prepared beforehand by the working group of the conference, for being too precise in its language. The document divided all relevant experiments into six categories, according to the probable degree of hazard. For each of the categories, procedures were proposed which were to reduce biological threats to the "generally accepted" risk level. Watson declared offhand that the moratorium should end. In signing the letter on the moratorium, he said, he thought there would be time to wait and see something that would be really frightening. As the head of the laboratory studying oncogenic viruses, he thought that his group worked with much more dangerous things than anything mentioned at the conference.

The controversy proved to center on the division of all the experiments according to the degree of danger linked with them; no accord could be reached on what kind of hazard it might be and how it was to be determined. Lederberg declared that if this classification must be made the basis for legislation, one should be firmly convinced that it is valid. Watson insisted that it was impossible to measure the risks involved, so there was no ground for ceasing research. Though such a situation was not conducive to making clearly formulated decisions, the conference achieved certain positive results. Berg emphasized that in spite of the fact that some scientists did not agree any self-regulation was needed, the main achievement of the conference was that it "raised the level of discussion in the field". No one will go into this field without thinking about the risks and benefits "and I couldn't have said that eight months ago".[11]

The Summary Statement of the Asilomar Conference recognized that definite scientific progress had been already made in investigations into recombinant DNA moleculcs. New methods which made it possible to combine the genetic information of

organisms widely differing from one another, led us into the sphere of biology with many unknown quantities. Given the present, rather limited, level of research in this field, estimation of the potential biological dangers involved proved to be a very difficult task. This circumstance prompted the understanding that reasonable caution was necessary in conducting research in this field. The conference participants agreed that the greater part of work in the reconstruction of recombinant DNA molecules can be performed on the condition that adequate precautions be observed, primarily by raising biological and physical barriers that would ensure keeping newly-created organisms within laboratory walls. Moreover, in the initial stages of research, containment standards should be rather high, and they should be modified as the technology is improved and estimates of probable risks changed. There are other kinds of experiments, however, in which potential risks are so great that they should not be conducted at all, given the present standard of containment. In a more distant future, grave problems may arise in connection with applying these methods in industry, medicine and agriculture. At the same time, future investigations and practical experience may reveal that many of the potential biological hazards are not as grave or less probable than it seems to us now.

The conference formulated the following principles for dealing with the potential risks, on which its recommendations and conclusions were based: "(i) that containment be made an essential consideration in the experimental design and (ii) that the effectiveness of the containment should match, as closely as possible, the estimated risk."[12] In conformity with these principles, since an agreement was to be reached on the scale of the risk (minimal, low, moderate and high risk), it was also necessary to work out a scale of containment corresponding to them. From time to time, both the means of measuring the risk and balancing it off with the corresponding level of precaution should be revised. It should be hoped, the Summary Statement continued, that a stable method could be established for comparing potential biological dangers and containment levels by drawing on both formal and informal information channels.

The conference participants divided permissible experiments into three categories by the risk level, ranging from those involving a minimal risk to those loaded with a high risk. A

fourth group of experiments, which presented such grave dangers that they should not be staged altogether until adequate safety measures were developed, was also identified. The conference recommended, as the chief method of precluding potential threats, the genetic reconstruction of such bacteria and viruses which possess a limited capacity for multiplying outside laboratory walls. Much attention in the Summary Statement was paid to ensuring that all personnel engaged in the experiments be well-informed about probable risks and taught the safety measures recommended for that particular risk level.

The appeal for a temporary moratorium and the Asilomar Conference were the culmination points in the events connected with genetic engineering. After the conference, discussions among the scientists flared up with a new force, since many thought the conference decisions to be too strict and not reasonably grounded. Still, the ban declared by the conference on certain kinds of experiments caused a certain re-orientation of research in genetic engineering. Particular attention, for example, was paid to creating weakened microorganisms which can be experimented upon in laboratory conditions but which cannot exist outside laboratories (they cannot populate man's intestines, cannot live in his semen and are easily destroyed by application of ordinary detergents). This makes it possible to overcome one of the chief barriers in the path of research in recombining DNA.

In 1975, the Recombinant DNA Molecule Programme Advisory Committee of the National Institutes of Health (USA) attempted to work out acceptable instructions on the basis of the Asilomar Conference principles, which would make it possible to control the technique involved in man-

ipulating genes from living organisms, in particular the use of weakened microorganisms for many types of experiment. The Committee devised several kinds of ordinary physical safety precautions, ranging from standard microbiological methods to specially designed installations with low air pressure, isolated by air locks and with showers at each entrance.

The instructions drafted by the Committee were on the whole much more reserved than the recommendations of the Asilomar Conference, thus they were subjected to devastating criticism on the part of the scientific community. Jonathan King, Professor of microbiology at the Massachusetts Institute of Technology, for example, said ironically that the National Institutes of Health were primarily concerned with geneticists, not the public. He warned the results of experiments in genetic engineering could be used by the US government for military purposes. It was also possible, in his opinion, that a human or animal gene introduced into a bacterium could prove to be capable of producing a corresponding protein. When such a bacterium gets into the human organism, the immune system may be activized, specific anti-bodies will be produced, and these in turn may lead to the emergence of previously unknown diseases. Supporters of strict measures for regulating the investigations thought that this probability should not be ignored, since it is the genetic structure of the human organism that is at stake. As a result of this criticism, the National Institutes of Health had to draft a new list of measures, published in late 1975, to control re-

search including the "technique for manipulating genes from living organisms",[13] which proved even more strict than the recommendations of the Asilomar Conference.

Following the publication of the list the laboratories began to be re-equipped to bring about conditions under which the experiments would be conducted in accordance with the new demands. In Cambridge, though, where Harvard University and the Massachusetts Institute of Technology, major educational and scientific research centres, are situated, events took an unexpected turn: representatives of the city council and the social community actively joined in the debates, alarmed by publications concerning the potential threat of gene-splicing experiments.

Finally, the city council, which had twice banned the third-type experiments, issued permission in 1977 under the condition that only genetically weakened microorganisms would be involved, and even more strict precautions would be observed than those framed by the National Institutes of Health. No permit was given for conducting experiments of the fourth – the most dangerous – type. The declaration of the Cambridge Experimentation Review Board (CERB) stated: "Knowledge, whether for its own sake or for its potential benefits to humankind, cannot serve as a justification for introducing risks to the public unless an informed citizenry is willing to accept those risks. Decisions regarding the appropriate course between the risks and benefits of a potentially dangerous scientific inquiry must not be adjudicated within the inner circles of the scientific establishment."[14]

Similar decisions were made in a number of scientific research centres of the USA, including Princeton, Amherst and Berkeley. Voices were constantly heard demanding immediate nationwide legislative measures regulating studies on recombinant DNA molecules. Senator Edward Kennedy and Rep-

resentative Paul Rogers handed in two bills for establishing very strict government control to regulate recombinant DNA research. The scientific community joined Congressmen in heated debates. Many biologists who were against a strict regulation actively opposed the bills, emphasizing the fact that recombination processes are a common occurrence in nature and do not, therefore, contain anything new in principle. True, supporters of "free inquiry" and opponents of the bills were sometimes accused of seeking their own, and far from always unselfish, ends. The American Society for Microbiology was especially active. It was supported by twenty US scientific societies and many outstanding biologists. They managed to win support from some senators and to form a strong lobby in Congress.* As a result, in 1977, Senator Kennedy had to withdraw his bill on setting up a national commission "to oversee all aspects of the regulation of recombinant DNA research", asking merely for a one-year moratorium on changes to the guidelines.[15]

The heated debates on genetic engineering are largely explained by the fact that it was the place of science in society in general and the principles of the latter's control over the former's development that were being decided, and not just the destiny of one of the branches of science. "The rancor generated by the dispute hardly makes sense as a specific response to this particular line of experimentation. In calling scientists to account for their work with genetically modified bacteria, the public and its representatives seem to be seizing an opportunity to establish a more general principle. A recondite area of modern biology has become a metaphor: the ul-

* David Baltimore, molecular biologist, said in this connection: "The new biology has become the new politics in a very concrete manner: biologists are spending their time in the halls of Congress trying to prevent the establishment of the first commission to control basic research." (cited from David Dickson, *The New Politics of Science*, New York, 1984, p. 249).

timate question is not whether bacteria can be contained in special laboratories but whether scientists can be contained in an ordinary society."[16]

By now, the sharp tone of the discussion has abated, though the situation in the field of genetic engineering has not become much clearer or simpler. As previously, there are problems demanding immediate solutions, and it is no wonder that the present situation with respect to the regulation of investigations and practical uses of recombinant DNA molecules is often described as quagmire. "A genie let out of the bottle"—this is how many people assess the potential danger of these investigations. Numerous sensational articles and comments by journalists and columnists warning that a monster like the one described by Mary Shelley in her famous novel, *Dr. Frankenstein,* can emerge one day from a genetic laboratory, have raised fears among the world public and alerted many scholars in the West.

In recent years, however, questions pertaining to genetic engineering have ceased to attract such close attention, owing to another vital problem looming large—possible cuts in allocations for this research that may result from the pressure of the public and the legislative acts of the administrative authorities, which would put a brake upon the pace of scientific progress. Therefore, while the movement for the termination of hazardous experiments in the field of genetic engineering is gaining momentum, a desperate search has been launched to find acceptable forms for continuing the experiments. Juridical aspects of the problem at hand are of utmost importance: proposals are being put for-

ward to change the regulation and in certain cases loosen the regime of experimentation, to revise some rules in conformity with the experience gained. Some US scholars take such proposals critically; others, on the contrary, think that the current regulation is in many cases too strict.

In 1974-1978, many scientists changed their views, coming to the conclusion that experiments involving recombinant DNA molecules present no danger at all. In 1978, virologists Wallace Rowe and Malcolm Martin conducted an experiment of the most hazardous variety. DNA contaminated with the virus causing a tumour (polyoma) in mice was introduced into plasmid or into a bacteriophage lambda. The resulting substrate was introduced into a bacterium of a colibacillus, and then it was checked whether this hybrid bacterium caused infection in mice. It was proved that infection was caused only in a small number of cases. The majority (but not all) of the scholars think that this result testifies to the security of such kind of experiments and proves that the restrictions imposed on them by the National Institutes of Health should be reduced.

Notably, Dr. James Watson, the Nobel Prize winner and co-discoverer of the structure of DNA, called for an end to governmental restrictions on DNA research as unneeded "nonsense", and said that there was no evidence that experiments in recombining DNA could do anyone any harm and that the time and dollars wasted on maintaining restrictions were "enormous". The precautions, in his opinion, had become a "disaster", and the public had been misled to fear "madman scenarios".[17]

Doubts are sometimes expressed as to whether the movement for imposing a moratorium and the Asilomar Conference decisions have been inspired by noble motives alone, in particular, if subsequent developments in this field are taken into account. There is no simple answer to this question. In the world we live in today, characterized by extremely intense political and ideological struggles, there is not in fact a problem, intention or action which could not be made use of, in definite circumstances, by reactionary social forces; even the most humane and noble intentions are sometimes distorted and made to serve entirely different purposes. Yet, in noting the negative aspect of the problem we are considering, we pronounce a certain judgement on the political situation, actions of the governments and Western propaganda agencies, but not as regards the scientists' movement itself. There is no doubt about the noble intentions of those scholars who initiated the movement for a moratorium on certain types of experiments, even though their behaviour was not always consistent.

Of great importance is the fact that the debates on socio-ethical problems in genetic engineering impelled many scientists to take a closer look at their relationships with society and at their own social responsibility.

David Baltimore said he realized in the course of the discussion that, no matter how great the might of modern science, it has failed to introduce any qualitative changes into the people's view of the world; it has not eradicated poverty and has not made people any cleverer, more conscientious or secure. He called on the scientists to learn their lesson from the events con-

nected with recombinant DNA research. In a report he made at the Hastings Center on October 15, 1980, he said, among other things: "If another issue appears on the horizon similar to the recombinant DNA controversy, I would hope that ... the scientific community will be more mature in its formulations and its responses so that the general public will be inclined to trust the activities of scientists rather than doubting their motives and their honesty."

At the same time, other opinions are also voiced, such as, for example, the position of US biologist Gerald Weissmann, who wrote in one of his articles that he favours a somewhat risky, but liberal point of view, that there is no limit to scientists' quests. "Truth at any price", i.e. unrestricted investigation of all things at all time is his motto – "an over-riding cultural value of our sort of civilization", in his expression.[18] Opposing restrictions on research in recombining DNA, he states that bans on the lines of research which may allegedly give birth to chimeras, are based on the assumption that scientific investigations can produce only bad effects.

As we see, Weissmann oversimplifies the position of his opponents. Of course, no seriously disposed people assert that scientific experiments can have only bad effects. They only seek to appeal to the community to make an attempt at assessing and, if possible, averting such bad effects; this problem is also posed when the issue of socio-ethical control over genetic engineering studies is raised.

Today, when experiments in genetic engineering are being conducted in many laboratories throughout the world, one may regard debates around recombinant DNA molecules as largely a thing of the past. This is so, because a system of precautionary measures has been elaborated for these experiments, because today it has become possible to predict to a certain extent the risk involved, and because the scientists, in raising the issue, have subsequently dis-

covered the discussions and, above all, decision-making on key issues are getting out of their control. This circumstance has made them beware of the threat of an entirely different kind. Their genuine concern about the possibility of incompetent interference in the practice and the very process of research, made some scientists forget about the potential danger of the investigations themselves. Today, in spite of the fact that far from all the problems raised have been solved, the moratorium on the experiments may be considered as pertaining to the history of science, and not so much to the so-called external history of science, e.g. its relationship with society, as to its internal history, i.e. the history of scientific concepts and views, and methods of research.

Today this fact assumes a new dimension and is assessed differently. This was revealed, in particular, during the Third All-Union Conference on Philosophical Issues in Natural Sciences (Moscow, April 1981). Ethical problems of science, including those linked with the moratorium, were raised in many reports. This testifies to an unflagging interest in these problems and to the extension of the sphere philosophical issues occupy in natural sciences.

Academician Bayev remarked, for example, that the manifesto urging voluntary refraining from the research for some time, triggered off a campaign against genetic engineering (mostly in the USA) in general, in which the mass media joined. As a whole, however, the "social resonance caused by genetic engineering concerned ethical, philosophical and social problems, and even if it was born of groundless fears, it shows that biology is coming to play a considerable part in modern society".[19] Academician Engelhardt estimated the situation somewhat differently: he pointed out that it was the supporters

of the "freedom of scientific quest" who opposed the moratorium, but common sense prevailed, and now the corresponding rules of research have been accepted in most countries, sometimes even of legislative nature. Thus, the scientists' joint efforts have succeeded in averting a grave threat. "The Asilomar moratorium can be justifiably considered as a model for the scientists to manifest their responsibility in the face of the threat which can assume the dimension of a real disaster, a genuine crisis."[20]

The variance of positions is obvious in this case; yet this difference is constructive enough and can serve as a starting point in further analysis, primarily because both positions essentially have the same roots, being based on a single empirical foundation. It is quite possible that the call for a moratorium was prompted not so much by the realization of dangers involved in the experiments as by attendant circumstances, such as self-advertising or gaining authority among the public. (Of course, speaking of the motivation of human actions, there is always a certain risk in pronouncing categorical judgements, because as a rule our actions are underlied by a whole tangle of motives.) However, even with this reservation, the appeal to public opinion in an attempt to attract its attention, not by promising benefits from the given field of research but by warning about the dangers involved, speaks for itself. The manifestation of a sense of social responsibility in this case appears not only as a socially acceptable, but also as a socially recognized and even, perhaps, a socially stimulated form of behaviour on the part of scientists. The knowledge that some experiments are harmless while others are hazardous, which is today at the disposal of science, is the result of scien-

tific investigations undertaken in connection with the moratorium. The division of experiments into categories in accordance with their potential risk level, elaboration of the technique to obtain weakened viruses which can only exist in artificially created laboratory conditions, results of the experiment of the most hazardous type – all this is in fact new knowledge, new scientific information, new technique of experimenting, obtained as a result of the moratorium and subsequent discussions which stimulated research in this direction.

This circumstance is of paramount importance, in our opinion. We see that the sense of the scientists' social responsibility, which is often spoken about as something ephemeral and practically non-existent, can appear as an operative and effective factor in the process of scientific cognition. Hence, social responsibility is not only linked with the participation of scholars in social movements; it can also be realized when a scientist acts as a researcher, i.e. when he is engaged in his direct cognitive activity. This, no doubt, refers not only to the field of genetic engineering, it is a fact of much more general significance.

Thus, we have seen that the scientists' social responsibility as a whole is not something of an external nature, something additional, artificially linked with their scientific activities as such. On the contrary, it is an organic component of scientific activities; it may have a tangible impact on the range of problems and lines of scientific research. In assessing the importance of debates on genetic engineering, it must be noted that they stirred the interest of the public in the socio-ethical aspects of the devel-

opment of modern science and in the scientists' responsibility to society. Now, however, public interest began to decline, because a certain practicable solution was found to the problems that were the subject of the discussion evoked by the moratorium.

There is no guarantee that one day new and no less complicated problems of ethical nature would not arise. Science's preparedness to face such problems will in many respects depend on how far it will manage to advance in analytical work in the ethics of science. In this respect, the importance of discussions on socio-ethical problems involved in genetic engineering goes far beyond the boundaries of a particular event in the history of a specific branch of biology. Undoubtedly, the experience gained by the scientists who found themselves in such a grave situation that did not allow for simple decisions, will not lose its significance in the future. This is why a critical socio-philosophical analysis of the debates around the moratorium in genetic engineering, carried out from Marxist positions, is of so much importance.[21]

In the course of the debates on problems involved in recombinant DNA experiments, many Western scholars were confronted with an acute and far from simple dilemma of ethical nature: responsibility to society demanded that they inform the public of the potential hazards presented by the planned investigations and also elaborate special precautionary measures to be observed in conducting such experiments. Their responsibility to science, however, demanded of them radically different actions. In this particular case, the scientists bore responsibility to

science for the novelty and authenticity of the knowledge they represent, but not only that; the main thing was that quite a real danger of incompetent interference in research activities emerged. Indeed, this could subsequently spread beyond the field of genetic engineering and cause unpredictable consequences for scientific development in the West.

As we have seen, the scientific community did not behave uniformly in this entangled situation. This clearly reveals that self-regulation mechanisms, based on ethical criteria, do not always function smoothly in science, while the interests of science and society may clash in a dramatic conflict.

As concerns the lesson to be learned from the debates, attention should be drawn to the following circumstance which went unnoticed during the discussions: the position adopted by supporters of absolute freedom of scientific quest lacked integrity in one substantial point. Rejecting a priori the potential danger of the experiments and in particular the possibility that harmful hybrid forms may emerge, they asserted, in fact, that the experiments had no practical value: indeed, how can one expect the investigations to produce a tangible effect while not hoping that finally viable hybrid organisms will be created? Yet it was precisely this risk of creating such viable hybrid organisms possessing unpredictable properties, that caused the debates and was the reason for all the points taken to assess the potential danger of the experiments.

In the socialist countries, genetic engineering developed in a fundamentally different social and

moral atmosphere. Academician Bayev, one of the leading Soviet scientists specializing in this field, stated: "We, in the Soviet Union, are not concerned either about the future, or that some all-powerful and blind forces can make scientific research in genetic engineering serve evil purposes despite the people's intentions and will. We are convinced that reason and good will will prevail, at least in our socialist country."[22] However, both in the Soviet Union and in other socialist countries, socio-ethical and humanistic problems involved in genetic engineering are broadly discussed, and the discussions are often initiated by leading experts in the field.

It becomes increasingly clear that the scientists and experts all over the world can hardly be satisfied with only discussing cognitive and technological problems arising in genetic engineering, while declaring complacently that all other developments, including the creation of biological weapons, depend not on their will but on the social relations and politics, on the good will of nations and international agreements. Such a position is fraught with danger because it serves to isolate scientists from social movements and can well disorientate them. In particular, this concerns those scholars who come out against anti-humane uses of advances in contemporary science, including biology. This form of protest is undoubtedly an important component of the struggle for peace and disarmament, and against imperialism and militarism. The real task facing the scientific community, including philosophers, is not to avoid controversial issues arising before mankind, in particular, in connection with recombinant

DNA research, but to indicate practical ways for their solution.

Now to conclude on this point. Today socio-ethical problems emerge both in respect to every scientific discovery and scientific problems, and to science as a whole. Therefore, discussions on problems connected with the regulation of genetic engineering research should not be regarded as something of a temporary, accidental nature. On the contrary, they are becoming an inherent feature of scientific activities, which testifies that a new stage has been reached in the development of science, that its role in the life of society and man is growing.

Acute socio-ethical problems, which emerged in connection with the development prospects of genetic engineering, can and must be solved on a broad humanist base, with benefits for humanity seen as a priority. However, this solution should not bar new roads to the knowledge of nature, which in the final analysis would also benefit man and augment his hopes for the future. Both science and humanity must rise to a new level of their evolution—both social and ethical—so that these hopes could be realized. More attention should be paid to socio-ethical problems involved in science, which link science and scientists with the life of mankind in innumerable ways and make them largely responsible for mankind, problems that are not at all simple to resolve. Diverse scientific discussions, comparison and struggle of ideas, and a fruitful dialogue between scholars holding different philosophical and socio-ethical views, are required. The task of estimating the risk involved in

all investigations and of setting that risk against the possible benefit to society in each particular case, excluding the marginal, is rather complicated. But this is precisely why the socio-ethical problems of science must always be held in the limelight by the entire scientific community, and not only by natural scientists, but also philosophers specializing in ethics, and lawyers. Political leaders must also constantly have them in their field of vision, as well as the world public. The fact that close attention of the world public has been drawn now to the ethical and legal aspects of genetic engineering, especially those related to human genetics, is a very positive phenomenon in itself.

Regrettably, though, some Western scientists who previously were very active in the debates on the ethical aspects of genetic engineering, now say that such debates are useless and even harmful, that the threat linked with such research has been exaggerated by the mass media, and that all kind of bans and restrictions can only result in retarding scientific progress in this important branch of knowledge. Their position can hardly be justified, either scientifically or ethically. Genetic engineering has drawn mankind's attention to the fact that society's control (social and ethical) should be established over developments taking place in science, in particular over those which can present a direct danger to man. The heat of the debates was unprecedented, even if compared to those of the danger of nuclear research. Up to now, it has been only a struggle of ideas, of words. The future will show who is right, since genetic engineering is bound to bring about

both good and bad effects. Geneticists predict fantastic advances in agriculture and medicine, but gene-based mass destruction weapons also can be developed, although they say these weapons will not be more powerful than nuclear missiles.

Our opinion is that, though definite precautionary measures are really observed in genetic engineering, its potential danger should not be underestimated, or we shall also underestimate the danger contained in uncontrolled investigations and uses of the results of this work, in particular in the development of biological weapons, various neo-eugenic projects of "moulding people" by means of genetic engineering and cloning.*

However, attempts to get free, under a plausible pretext, from all the agreements and bans and brand them, like all discussions of the ethical problems of science, in particular of the socio-ethical regulation of genetic-engineering activities, as harmful and retarding progress in scientific research, cannot be justified. This is why the Soviet public regard proposals on the establishment of a moratorium over certain types of research as a positive measure, though they are well aware of its limited nature and of the utopian character of the very idea of science's self-regu-

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* Recently, US experts have been asserting that biological weapons of a much greater destructive power than weapons developed by other methods, cannot be created by means of genetic engineering. Moreover, they discuss the possibility of creating a vaccine against bacteriological weapons, by drawing on the genetic engineering technique. This idea is upheld by some scholars in the socialist countries (see E. Heissler, "About the Misuse of the Results of Research in Molecular and Cell Biology: Facts and Myths", in: *Mir nauki*, No. 1, 1982).

lation by means of moral-ethical rules alone. Yet this kind of protest against using science for anti-humane purposes should not be underestimated, even if in some cases the heads of the scientific and technological establishments in the West make use of it to serve purposes far from the genuine interests of science and humanity.

Recent discussions of the socio-ethical problems of genetic engineering have revealed one more aspect to it. The point is that in the West, genetic engineering and biotechnology are a field in which the interests of science, business and politics are intertwined. This is a specific field in which in many cases there is no gap between obtaining fundamental scientific results and discovering realistic possibilities of their practical application. As a result, genetic engineering, i.e. manipulations with recombinant DNA, has become essentially the core of so-called "new technology", and drew the attention of business circles. Peter Daly, an Irish biotechnologist, writes that "in this sense biotechnology represents not only the application of biology to industry but the commercialization of biology itself".[23]

Many US scientists could not resist the temptation of quickly making a fortune, and some even became heads of biotechnological firms. It is not a rare occurrence that a scholar exchanges his modest pay at a university for a high salary of an employee at a firm. Half, or even more, of the personnel of biotechnological companies is comprised of scientific workers; such firms derive up to 95 per cent of their incomes from research and development work

made on contracts. Philip J. Hilts, a writer on the national staff of *The Washington Post,* noted, for example, that all prominent molecular biologists in the USA have an agreement with a firm interested in the commercial aspects of biotechnology.[24]

Approximately seven years after the Asilomar Conference took place, another meeting of scientists, "Asilomar-2", was convened in the same town. Once again, the potential dangers of research into genetic engineering were discussed; this time, however, it was social and not biological problems that were raised – growing tensions in the scientific and academic communities caused by the eruption of commercial interest in these techniques. According to David Dickson, an expert in the political problems in the sphere of science, the meeting in which mainly university authorities and representatives of the business circles took part, was called because of the public concern with the upsurge of commercial interest in bold biotechnological research. "This interest," Dickson wrote, "has brought lucrative dividends to many university scientists, but it also threatened the integrity of university research – for example, by raising barriers to the open exchange of information, stimulating conflicts of interest and loyalty between a scientist's commercial and academic commitments, and disrupting the social relations of the laboratory."[25]

At the second conference, too, many voices were raised to express concern about the possibility of regulation from the outside, in particular, by the local authorities. This concern, though, related primarily to such regulation which would interfere with

the universities' links with firms. However, the strengthening of such links does not promote progress in science, what with placing research results on secret lists and patenting them. In the statement he made before microbiologists in Dallas in 1981, the lawyer of the Exxon company advised his listeners that, before giving a presentation of their reports to scientific conferences, they should go to a notary public and have notarized this material and the date and place where a particular idea came to their mind, as well as what colleges they were going to visit and have a professional conversation about what they were doing. Dr. Jonathan King, who was among the listeners, notes: "You know, I was chilled by that. A few of my colleagues said it is a total change in the canon of what is proper scientific ethics and how science works."[26] The matter, however, is not to be reduced to the ethical aspects of the problem. The secrecy imposed on research inevitably tells on its quality, since cases of parallel investigations cannot be excluded. Beginners also find themselves in a difficult situation, because their scientific leaders prefer to direct their enthusiastic efforts, proceeding from commercial rather than scientific considerations. The brain-drain from the universities to the firms also lowers the educational standards of the training of future researchers.

Genetic engineering is now also made use of as a means of foreign policies. One of the reasons behind placing biotechnological information on secret lists is to preclude its falling into the hands of the socialist countries, which would be undesirable for "security" considerations. In 1979, the US government

established export controls on biotechnology products and processes under the pretext that they may have potential biological warfare uses in countries hostile to the West. It should be noted that it is the developing countries which badly need many of the products that can be obtained through genetic-engineering technologies. However, the transnational corporations intentionally curb the spread of relevant scientific information, thus interfering with the development of biotechnological production in those countries, for they are interested in deriving profits from selling them finished products.

Interference of business circles into the sphere of biotechnology and genetic engineering distorts the concept of the scientists' social responsibilities, which, in the words of Dickson, "have recently been given a new interpretation: they are now defined as the need to help private corporations achieve their economic and political objectives".[27] The commercialization of biology is fraught with a great threat to the spirit of science, to its ethical principles and rules and, in the long run, it may present a real threat to science as such. The threat assumes all the greater dimensions since, as the Western press declared, a new era in biotechnology has been ushered in on October 9, 1985, after US veterinary Roger Salaine had introduced a living genetically modified virus in piglets – the world's first practical application of a living organism created by the genetic engineering technique. What turn events will take in the future and what new dangers may be in store for humanity as a result of such practical applications is difficult to predict.

Further developments linked with field tests and the prospects of the practical application of genetically modified organisms, testify to the fact that, evidently, genetic engineering and biotechnology will lead to heated debates and sharp conflicts, including on socio-ethical and legal problems, for a long time to come.

Thus, according to *The New-York Times* of November 13, 1986, a team of researchers from Oregon State University carried out a series of field tests of a genetically modified viral vaccine in New Zealand. The tests were sponsored by the US Department of Agriculture and were approved by two New Zealand governmental agencies. It was also reported that another genetically modified vaccine, created at the Wistar Institute of Biomedicine in Philadelphia, was tested in Argentina, this time without notification of that country's government.

In both cases, and possibly also in others which remained secret, the researchers decided to carry out the testing abroad so as to get round the regulations on this kind of testing established in the USA.

Veterinaries who conducted the tests in New Zealand (37 calves, 16 chickens and 4 sheep were vaccinated, and all the vaccinations were successful) stated that the regulations in the United States for approving this kind of tests is a tangled, vague and much too slow programme. And though the experimenters from the Oregon University were issued permission for the tests by the University Biosecurity Committee, they did not venture to ask for a permit either from the US Department of

Agriculture or any other Federal agency. Thus, we see that the USA acts as an "exporter" of risks connected with the introduction of genetically modified organisms into living nature.

In the USA itself, there is a rather strict approach to conducting field tests of genetically modified organisms. The US Environmental Protection Agency (EPA), for example, decided on May 20, 1986, to ban the experiment undertaken by the Moncanto company, which spends one-fifth of its scientific research budget (520 million dollars) for biotechnology investigations. It was planned to emit into the environment a new form of life, evolved in the laboratory by combining genetic material from two different bacteria species. A group of political studies called the Fund of Economic Trends and led by Jeremy Rifkin, an experienced opponent of genetic engineering and biotechnology, opposed this experiment. In particular, Rifkin asserted that genetic engineering could not have both good and bad sides to it, and that the striving for scientific progress was the nation's pathology, its disease.

Many scholars and administrators from US Federal and private agencies turn for help to Rifkin because in this way they can bring their apprehensions to public attention without endangering their own career. A young scientific worker who was employed in a biotechnology firm in Oakland (California) told Rifkin that in 1985 the firm secretly tested a genetically modified microbe organism outside the laboratory walls. Rifkin and his collaborators caused EPA to undertake an investigation, accuse

the firm of the falsification of information and impose a fine of $20,000 on it.

The prehistory of the ban on biotechnology experiments at the Moncanto company is as follows: Rifkin demanded from EPA information on the safety of the investigations carried out by the company, and then placed it under expert examination by several ecologists and microbiologists. The experts came to the conclusion that the safety measures provided by the company in this research were not adequate. The vagueness concerning the risks and benefits promised by the planned field tests compelled EPA to decide on banning them. In greeting this decision, Rifkin declared: We are duty-bound to ourselves and to the next generation to raise these problems and ask the questions. We speak of our being able to modify the genetic code of life, but this is an evil ability and evil power. We must have serious, reasonable and well thought-out public debates. We cannot leave things in the hands of Moncanto.

The *Toronto Star* called this ban a strong blow against the firm and the entire US biotechnology industry. The question of how genetically modified organisms, created in the laboratory, will behave when released into the natural environment, has not been removed from the agenda today. Reasonable caution in studying this question seems absolutely essential, and in this connection the commercial boom around biotechnology is fraught with a particularly great danger.

Under these circumstances, it is particularly important to continue studying the socio-ethical as-

pects of research into genetic engineering and biotechnology and their practical uses. Special emphasis should be placed on the all-important role of the social context in which they develop and on the importance of elaborating the socio-ethical and humanist aspects of this kind of research and its applications both at present and in the future, including the issues involved in the ethics of genetic control, cloning and neo-eugenics.

NOTES

[1]Aldous Huxley, *Brave New World*, Penguin Books, Harmondsworth, Middlesex, 1952, pp. 9-10.

[2]A.A. Bayev, "Contemporary Biology as a Social Phenomenon", *Voprosy filosofii*, No. 3, 1981, p. 19.

[3]See: Peter Daly, *The Biotechnology Business. A Strategic Analysis*, Frances Pinter (Publishers) Ltd., London, 1985, p. 16.

[4]See: David Dickson, *The New Politics of Science*, Pantheon Books, New York, 1984, p. 75.

[5]Sheldon Krimsky, *Genetic Alchemy. The Social History of the Recombinant DNA Controversy*, Cambridge (Massachusetts), London, 1982, p. 286.

[6]Ibid., p. 17.

[7]Cited from: William Bennett and Joel Gurin, "Science That Frightens Scientists: the Great Debate over DNA", in: *The Atlantic*, Vol. 239, No. 2, February 1977, p. 49.

[8]W.A. Engelhardt, "Two Sides of Molecular Engineering", in: *Za rubezhom*, No. 36, 1974, p. 20.

[9]William Bennett, Joel Gurin, op. cit., pp. 43-44.

[10]*Science*, Vol. 187, No. 4180, March 14, 1975, p. 931.

[11]*Science News*, Vol. 107, No. 10, March 1975, p. 156.

[12]"Summary Statement of the Asilomar Conference on Recombinant DNA Molecules", in: *Proceedings of the National*

Academy of Sciences of the United States of America, Vol. 72, No. 6, June 1975, p. 1981.

[13]See: *Nature,* Vol. 258, No. 5536, December 18, 1975, p. 561.

[14]Sheldon Krimsky, op. cit., p. 307.

[15]David Dickson, op. cit., pp. 244, 249.

[16]William Bennett and Joel Gurin, op. cit., p. 62.

[17]See: Victor Cohn, "End of Curbs on DNA Research Is Urged", in: *International Herald Tribune,* December 20, 1977, p. 5.

[18]See: Gerald Weissmann, "Science for Science's Sake", in: *Human Life: Controversies and Concerns,* pp. 26-33.

[19]*Dialectics in the Sciences of Nature and Man,* Vol. 4, Moscow, 1983, p. 116 (in Russian).

[20]Ibid., p. 128.

[21]See, for example: Hans-Martin Dietl, Heinz Gahse, Hans-Georg Kranhold, *Humangenetik in der sozialistischen Gesellschaft. Philosophoethische und soziale Probleme,* Fischer, Jena, 1977; also see: N.V. Turbin, "Genetic Engineering: Reality, Prospects and Apprehensions", in: *Voprosy filosofii,* No. 1, 1975.

[22]A.A. Bayev, "Social Aspects of Genetic Engineering", in: *Philosophic Struggle of Ideas in Modern Natural Science,* Moscow, 1977, p. 146 (in Russian).

[23]Peter Daly, op. cit., p. 57.

[24]See: Philip J. Hilts, *Scientific Temperaments. Three Lives in Contemporary Science,* Simon and Schuster, New York, 1982.

[25]David Dickson, op. cit., p. 57.

[26]*Commercialization of Academic Biomedical Research. Hearings before the Subcommittee on Investigations and Oversight and the Subcommittee on Science, Research and Technology. US House of Representatives, Ninety-Seventh Congress, First Session, June 8 and 9, 1981,* US Government Printing Office. Washington, 1981, p. 76.

[27]David Dickson, op. cit., p. 104.

CHAPTER 7

Human Genetics and the Debate on the Ethics of Genetic Control. Socio-Ethical Regulation of Scientific Studies

One of the results of wide discussions on recombinant DNA experiments was the invigorated debate on the socio-ethical prospects not only of genetic engineering, but of genetic control in general. As David Baltimore noted, "If safety were the most important consideration behind the debate about recombinant DNA then we might expect the debate to focus on the hazards of doing recombinant DNA experiments. Instead, many of the discussions that start considering such questions, soon turn to a consideration of genetic engineering."[1] Further he poses "two very deep and perplexing problems: who is to decide, and how shall they decide what genes are malfunctional"?[2] The fear that decision-making will be done by dictators in the name of consolidating their own power, has transformed genetic engineering into a symbol of moral problems born of present-day biology, a symbol of the formidable potential of modern technology as a whole.

Biologists Erwin Chargaff and George Wald, Nobel Prize winners, took an active part in the debate. In his letter to the *Science* magazine, Chargaff

speaks of "the awesome irreversibility of what is being contemplated" as a result of recombinant DNA experiments. "You can stop splitting the atom; you can stop visiting the moon; you can stop using aerosols; you may even decide not to kill entire populations by the use of a few bombs. But you cannot recall a new form of life... An irreversible attack on the biosphere is something so unheard-of, so unthinkable to previous generations, that I could only wish that mine had not been guilty of it."[3] The letter was written in connection with recombinant DNA experiments, but in fact Chargaff raised much broader problems: "Have we the right to counteract, irreversibly, the evolutionary wisdom of millions of years, in order to satisfy the ambition and the curiosity of a few scientists? This world is given to us on loan. We come and we go; and after a time we leave earth and air and water to others who come after us. My generation, or perhaps the one preceding mine, has been the first to engage, under the leadership of the exact sciences, in a destructive colonial warfare against nature. The future will curse us for it."[4]

An original interpretation of ethical problems involved in genetic control, in particular in connection with neo-eugenic projects, has been posed in *Fabricated Man* by Paul Ramsey. Referring to the geneticist H.J. Muller, he asserts that "there is one and only one way of avoiding the 'fiasco of a full-fledged resumption of ordinary natural selection. That method, whether we like it or not, is purposive control over reproduction', over its quality no less than its quantity (H.J. Muller. 'Our Load of Mutations',

in: *The American Journal of Human Genetics*, June 1950: 165, p. 150.)"[5]

Ramsey makes two proposals. First, he proposes a frontal attack on harmful genetic mutations and on dangerously modified genes by means of "genetic surgery", i.e. by the introduction of certain anti-mutagenous chemical preparations which would make the genes develop in a backward direction ("back-mutation"), or would from the very beginning preclude the possibility of the genetic effects of harmful mutations. Soon the time will come, he writes, when such interference will be done within the programmes of "negative" or "preventive" eugenics. As soon as man is able to replace a "bad" gene with a "good" one, it will become possible to induce a programme of "progressive" eugenics, or of "positive" genetic improvement. Second, Ramsey focusses on the phenotype of man, having in mind "eugenically directed birth control", "parental selection", "germinal choice", or "gross empirical selection for traits in human reproduction".[6] As we see, he assumes that eugenic measures can be used, but under strict ethical control, only within the framework of human morality, and on the condition that the principles of "free will" and "free thinking" be complied with. Hence, eugenics is not rejected but, in Ramsey's opinion, it must be combined with the Christian principles which are allegedly the basis of genuine science.

Neo-eugenic concepts are severely criticized "from the right". Charles Frankel, for one, Professor of Columbia University, writes in his article, "The Specter of Eugenics",[7] commenting on the general success of the branch of contemporary science often denoted by the term "biomedicine", that scholars engaged in that science had for the first time set before mankind the objective "of being able to make itself". That confronts science with the problem not only of methods and means, but also of goals and intentions. In this sense, Frankel regards biomedicine as a disorientating science, since it arouses hostility and suspicion towards science and technology in general, and towards basic principles of intellectual freedom and rational thinking in particular. He also presents "some cautionary considerations" which, he thinks, might be "helpful in interpreting the significance of biomedicine", and first of all of eugenics.

Frankel justly remarks that "positive eugenics" sets itself great but poorly defined and uncoordinated goals, because we are not aware of a universal ideal of man which would be worthy of copying. Moreover, the very possibility of the existence of such a universal ideal is highly doubtful. Thus, Frankel rejects all eugenic projects. Neither does he approve of their criticism from religious positions (the sanctity of human life, etc.), because religious principles are in no position to preclude a wide use of eugenic methods. Various bans placed on scientific research can produce no results either, since, for example, experiments leading to the growing of babies in laboratory test-tubes are the same kind of experiment which allows us to investigate the origin of cancer tumours. In the final analysis, Frankel arrives at the conclusion that the very idea of the transformation of the human race should be rejected. The reason for the emergence of eugenic projects, he said, should not be sought for in science, but in the idea of revolution in general, with its striving to create "a new man", to build human conscience according to a certain model. This is a specific position on the issue under review, worded by a representative of the scientific community, and it should be also taken into account in criticizing eugenics from Marxist positions.

In our opinion, the neo-eugenic "great project" of creating a "new man" has nothing to do with the Marxist-Leninist teachings on the ways of shaping man in a socialist and communist society, on man's free and harmonious development, physical and spiritual, as the chief goal of history. A warped, one-sided social-biologism renders eugenic projects not only utopian, but also reactionary. Moreover, the socialist revolution, which really sets about developing a new man and educating him in work, in the interplay of a whole set of social relationships, can be linked to eugenics only by error or ill-intention on the part of anti-communist bourgeois ideologists.

We can hardly share the enthusiasm of those who are searching for a solution to social and human problems in genetic control. This road seems to be the safest and shortest only at first glance. As it is, it is strewn with new and even more serious problems than those undertaken by the overenthusiastic adherents of genetic control. Today the humanism of a scholar devoid of concrete historical and socio-ethical orientation, invariably proves to be either something ephemeral, purely verbal, or even – and precisely because of its abstract nature – fraught with its very opposite, anti-humanism. Those claiming the role of mankind's saviours from inborn defects, in fact amaze one with the lightness with which they reveal these defects – both physical and mental – in contemporary man, whom they see as an embodiment of all sorts of such defects.

The debate on the ethics of genetic control is also noteworthy in that it often involves very distant, and sometimes even utopian, opportunities that may allegedly result from the development of genetics. The urgency and acuteness of the debate is explained by the fact that it makes us realize the vital nature of such eternal problems as man, his freedom, his possibilities and his predestination, rather than by the realistic character of these opportunities. Distant prospects opened up by genetics exert their influence on us even today, by making us ponder over whether we really wish people be reproduced by cloning. We must have a close look at ourselves in order to realize what it is we really wish to attain, what we strive for, and what is unacceptable to us.

It is not only the future — near or distant — that is at stake in this debate, but the present-day reality. That is why drawing on the means of philosophical analysis and turning to the age-old experience philosophy gained in studying this kind of problems, become not only desirable but indispensable from the social point of view. The scientific progress made in our day again and again puts before mankind the problems of self-determination and of reassessing values. Man would be lost in the face of this formidable task if not for the experiences accumulated by philosophy.

Widely current in the West is the idea that research and practice of genetic control should be considered out of the context of social, humanist and ethical values.

US geneticist, Joshua Lederberg, for example, while trying to elaborate on the "technology of man-copying", attempted to prove that his method is better than genetic engineering, since it is going to reproduce already known genotypes, while genetic engineering is concerned with the creation of new ones, which is fraught with all kind of dangers and risks. In both cases, however, he laid stress on considerations of "pure experimentation", and not on moral and ethical problems. He thought that for cloning reproduction to be launched, a personal decision made by society's minority is enough, i.e. by those who would agree to reproduce their own genetic copies; he did not take account of the fact that there is the danger of creating an elite which would threaten society as a whole. Moreover, he saw many advantages in such selective decision-making,

since, in his opinion, representatives of the elite would be closely related, the struggle between generations would disappear from the scene, etc. True, he changed his views on this issue under the impact of the scientists' growing intention to take into consideration ethical norms of genetic control.

In his letter to R. Kirstein, Director of the National Institute of General Medicine, written in October 1977, Lederberg writes concerning the future of genetic research, in particular cloning, that researchers engaged in genetic studies are faced with two chief tasks: (a) to try to minimize suffering resulting from genetic disorders and (b) to reveal the role of genetic factors in contracting other diseases. To fulfil the first task, he said, it is necessary to work out practical methods of intrauterine diagnostic. Research in the sphere of molecular and cell biology would reveal new possibilities in therapeutic treatment of genetic diseases. Also promising are the prospects connected with euphenic modifications, i.e. such methods of treatment which lessen the suffering caused by the disease, while not interfering in the organism's genetic base.

Diseases caused by the defect of a single gene are of special interest to researchers who try to fathom the role of genetic factors in the development of man. Regrettably, Lederberg writes, genetic factors cannot be regarded as the only source of disease in the most serious cases from the point of view of the health service. Among such diseases are atherosclerosis, high blood pressure, schizophrenia, diabetes and, in a definite sense, predisposition to certain forms of cancer. Today we know but little about the role of genetic factors in the development of such diseases. Paradoxical as it is, Lederberg continues, basic research and discoveries in this area may prove to be most useful for medical practice, since the main difficulty in investigating the causes of such diseases lies in identifying the defective chromosome. New methods of DNA research elaborated as a result of the so-called recombinant DNA experiments, are a powerful means that can be used to tackle these problems. Yet today, Lederberg further notes, it is not purely technical hazards that present the greatest obstacle to the expansion of such research, but attempts to restrict the investigations. He emphasizes that

the public at large is not always adequately informed about the risks linked with the banning of this kind of research.

There is much talk concerning the existing possibility to modify people by means of genetic techniques, he continues, which are justified by utopian or medicinal goals. He thinks such talk to be useless because at present there is not a single genetic modification method which would not present a serious risk for man. Besides, such methods cannot be accepted also because we have but poor knowledge about man's biological capabilities. Thus, any interference in his genetic base is monstrous from the point of view of ethics.

In this case, as we see, Lederberg took a radically different position in comparison with what he himself said earlier. This letter was published as a supplement to *The Cloning of Man: A Brave New Hope – Or Horror?*, a book edited by Martin Ebon,[8] in which similar problems come under close consideration. In the words of Ebon, debates on cloning were triggered by a book by David M. Rorvik, *In His Image.*[9]

According to Rorvik, the cloning of human beings had already been performed, so that in mid-1978 the clone was already one and a half years old. The scandalous success of Rorvik's book, Ebon writes, has largely discredited the idea of cloning, yet, in the context of genetic and biomedical investigations underway at present, cloning seems to be a serious and worthy object of discussion. Ebon repeatedly refers to the thought that the idea of cloning, i.e. of creating human beings artificially, has its source in ancient myths and legends (in particular, he refers to the myth about Prometheus and Pandora); these myths and legends are of perpetual value since the problems raised in them are eternal.

Ebon says that mankind has every reason to regard the clone as a "monster", and people engaged in creating it, as scholarly madmen whose activities are led by the devil. History shows, he asserts, that grotesque forms of evolution are always a corollary

of the periods of social decline, moral degradation, the overwhelming power of money and bureaucratic governments. The notions of scholarly madmen, in his opinion, are also of ancient origin, for they have their roots in those times when alchemists were engaged in efforts to create a homunculus, which were then considered to be heresy. Today, Ebon states, public opinion believes that scientists working on similar problems do not wish to abide by recognized moral principles. At first, such a scientist is apt to think that his activity serves to promote progress in science and society. However, as his work progresses, he forgets his initial goals and tasks and turns his efforts and talent to the service of his own selfish ends, not the interests of science.

Ebon thinks that such concepts about the scholar and his activity are widely current today and are well-grounded. He explains that by the change that occurred in the nature of scientific research itself, by the scientists' drive for allocations and subsidies, by their narrow specialization, and also by the omnipotence of bureaucracy. This situation has created a deep gulf which now divides the interests of ordinary people and medical science.

At the same time, Ebon continues, researchers in medicine and geneticists are convinced that erroneous notions about their activities and their goals and methods, are intentionally circulated among the public, aimed at spreading sentiments against scientists. More and more people are beginning to think that protection of the environment from the destructive impact of scientific and technological advances can be of greater importance in fighting cancer than various biological experiments, including those of cloning and genetic engineering in general. Both laymen and lawyers are equally confused by contradictory statements and ideas formulated by leading geneticists. When in the mid-1960s, J.B. Gardon performed the world's first cloning of a frog, even conservative scholars predicted that, within the nearest decade, the cloning of man will also become possible. The debate on cloning was given fresh impetus when, in 1978, British gynecologist Patrick C. Steptoe and physiologist Robert G. Edwards performed surgery for the artificial fertilization and subsequent reimplantation into the uterus of a woman patient of an egg-cell taken from the same patient in the Cambridge University hospital. Despite the fact that the

method applied by the two scholars differed from the technique of cloning, it also caused heated discussion.

Referring to the opinion of science columnist M. Chrichton, that the idea of cloning itself does not possess the intellectual power of a fundamental scientific discovery and should not be regarded as an important social phenomenon, on a par with other technological novelties, Ebon asks a very logical question: why is it, then, that the public took the idea of cloning so closely to heart, why has it produced such tumult?

Ebon distinguishes between two major types of motivation leading to the acceleration of research in cloning. First, it can be the wish of a certain person (or a group of persons), possessing substantial financial means, to create a duplicate of his own, dearly beloved self, or a "race of masters". In this case, eugenic principles may prove to be connected with nationalistic moods and, sooner or later, such people can be expected to make an attempt to apply cloning for their own selfish ends.

Second, experiments on cloning can be conducted to obtain progeny from the most valuable domestic animals. Ebon thinks that such experiments are already underway, being conducted in secrecy. He notes that, though all prophecies and forecasts more often than not go against the prophets themselves, experiments to grow human beings in laboratory test-tubes look absurd in the light of the existing threat of overpopulation, so it is doubtful that they are conducted at all.

At the same time, he is of the opinion that geneticists have the right to assert that mankind has already launched various forms of "selective reproduction", though selection in such reproduction is governed by accident and is often linked with factors having nothing in common with sexual advantages. Thus, the development of the means of transportation has greatly expanded the geography of human contacts. There are many other factors of socio-economic and cultural character, exerting an influence on sexual selection and raising many problems which are not yet widely discussed. Ebon refers to Lederberg's statement that the problem of cloning must be regarded in the light of a more general problem – that of fathers and sons. But where is the border between the responsibility of parents and of society for the children's fate, for the manipulation with their development? Though Lederberg was the first scholar who made us seriously consider the possibility of the cloning of man

and its consequences, Ebon continues, he himself does not believe that this method of obtaining progeny can be of any practical importance. Lederberg rejects the widely spread opinion that if something is possible in principle, it will necessarily be realized in practice, given a certain level of technological development; he regards such thinking as a "myth".

Ebon shares this view: he writes that in answer to the question, "Is there nothing to stop it?", voiced by the alarmed public, he could cite a great many technological discoveries which are not applied today for socio-economic and political reasons. He is doubtful whether experiments in cloning may be of any help in revealing the causes of cancer. Discoveries made in this field, he says, should be treated with extreme caution.

Ebon renders at length the dialogue between journalists and scientists which was telecast in the USA in April 1978. The programme was called "The Cloning". R. Mackinnel (geneticist, University of Minnesota), C. McCarthy (Director of the National Institutes of Health) and L. Tribe (professor of the School of Law in Harvard) answered the questions put by journalists. The participants in the dialogue expressed diverse views in respect to the cloning of mice and rabbits, but were unanimous in their estimation of the cloning of man. Putting forward different reasons (including ethical ones) in support of their stand, they presented a united front against the realization of this project. Their position was shared by many other specialists, whom Ebon interviewed. He himself formulated his own position as follows: "And, finally, speaking as a public-spirited citizen myself: Any effort to clone a human being, to create a man-made man, is, in my opinion, immoral, tragic and totally unnecessary."[10]

Ebon's thinking is symptomatic on the ethical plane. Though not expressed by a scientist engaged in genetic studies, it reflects the position shared by many scientists. The attitude to cloning of James Watson, expressed in his statement published in the Supplement to Ebon's book, is highly characteristic. After discussing the content of the cloning technique and the experiments already being conducted,

Watson concluded that, in theoretical terms, all forms of life on the level of higher animals can in the final account be reproduced by cloning.

If this is really the case, unpredictable consequences are in store for the human race. The idea was a boon for the editors of numerous magazines who promptly put photographs of the identical offspring of Ringo Starr and Raquel Welch on the covers of their publications. One can imagine quite fantastic things in respect to the possibility of obtaining "reprints" of outstanding persons. Therefore, Watson states, many biologists, and in particular those who are directly engaged in studying the problem, must seriously ponder all possible uses of the results of their experiments and start a dialogue with the public in order to inform the people of the essence of their investigations.

Today, however, in Watson's words, we have to state that there is no such dialogue. In a few articles dealing with the future of biology, the possibility of obtaining progeny by cloning is mentioned. However, the debate on this issue is devoid of any realistic content to such an extent that it can only serve to "lull" public opinion. Watson raises the following vital questions in this connection: Does this silence amount to intentionally concealing from the public the potential danger these experiments present to the very foundations of human life? Is it caused by fear of a possible public reaction and of being deprived of capital investments in so-called pure research, modest as they are even now? Or does it only mean that the majority of scholars have locked themselves in the ivory tower of pure science, leaving the practical issues involved to lawyers and politicians?

Watson warns that very soon society will be faced with the necessity to make all-important decisions. He is convinced that considerations of the possible abuses of the said technique must outweigh arguments concerning the possibility of alleviating the sufferings of childless couples. It is evident, too, that different social systems will approach and resolve these problems in different ways. Therefore, one should realize that in individual countries this technique will become ordinary medical practice and that it will spread throughout the world in 10 or 20 years after its elaboration. Understandably, conditions are thus ripening for legal or illegal attempts at the cloning of man.

Of course, there is no reason to believe that such efforts will be made by all means. The majority of medics will probably not make cloning as such the goal of their experiments. Yet it would be a grave mistake to think that all will instinctively refrain from setting this goal. There are people who, in Watson's opinion, are genuinely convinced that the cloning of outstanding persons is necessary, especially in our age of computerization when man finds himself unable to compete with machinery. Besides, after clinical cloning is widely spread, the technique will no longer be too expensive for patients – a consideration that could have a sobering effect. He thinks it possible that the first man-made human being, produced by cloning, will appear in 20 or 50 years, if not earlier.

The first reaction of people to this conclusion is in most cases despair and hopelessness: indeed, it is the nature of the parents-children relationship that is at stake, to say nothing of the values involved in the uniqueness of each individual. Therefore, many people believe that the significance of investigations in the non-traditional technique of human reproduction should not be overstated. A ban imposed on experiments in cell-fusion would lead to withdrawing allocations for this kind of experiments, and thus would put off the implantation of such cells into the human egg-cell. Declaring experiments with human embryos illegal (or the confirmation of their illegal nature) would have even a stronger effect.

However, there is no rumour of such bans being contemplated. First, the technique of cell-fusion is today one of the most promising lines in the study of the genetic roots of cancer growths. The entire humanity is engaged in fusing healthy and cancerous cells in order to reveal and identify specific chromosomes promoting the development of various cancer forms. A similar technique is also used to analyze biochemical processes in other human diseases. All attempts to stop these experiments because of their potential threat to humanity could hardly be effective, and references to this threat would not be found convincing in comparison with the real threat of cancer and some other diseases.

The states which try to formulate their policy on experiments of artificially growing human embryos, must consider the fact that the problem at hand is international: even if one or several countries ban this kind of research, there is no guarantee that

their policy will not be neutralized by other countries, where the research continues.

In Watson's opinion, we must inform as many people as possible of the prospects and probable risks involved in the opportunity to reproduce human beings, since both positive and negative consequences of its realization should be seriously weighed. It is not only scholars, but the people at large, too, who are facing this problem, and it should be tackled by the joint effort of entire mankind. To do that, certain forms of "international consciousness" should be worked out, and corresponding international agreements termed. If we do not start thinking of these problems today, the day may come when we may find ourselves deprived of the opportunity to make unhampered decisions, Watson concludes.

The conclusion presented in such a general form cannot be refuted. The important thing is to see on what principle and in what form it can be realized, and subsequent developments confirmed this, as well as proved that a Marxist socio-ethical, humanistic approach is highly relevant. In rejecting the idea of permissibility to "mould" people by biological (genetic, etc.) methods, Marxist scholars are aware of a wide range not only of specific, but also of related ethical problems demanding careful analysis and wide discussion. A debate of this kind has taken place in the Soviet Union, at a round table organized by the *Voprosy filosofii* journal.[11]

Geneticist A.A. Neifakh spoke of the research into the transplantation of nuclei and the possibility to apply it to man, which would make it possible to artificially obtain monovular twins. If such twins do not suffer from grave diseases, traumas and other serious predicaments, one can expect not only an outward, but also physiological and even mental likeness. Indeed, mentality depends on the environment, upbringing and education in much greater measure than the morphology, so greater variety

can be expected in this respect. Yet, given equal conditions, one can expect that the basic mental traits in monovular twins, in particular, their creative abilities, will be largely similar. This, in Neifakh's opinion, makes it possible to speak of a new way of creating highly gifted people, which is required to intensify scientific and technological progress and the flourishing of arts. The nuclei transplantation technique, if applied to man, would enable us to preserve those outstanding genetic combinations which occur accidentally and are buried together with the persons possessing them. Such unjustified losses could be prevented if the said technique be used. Neifakh objects to regarding the nuclei transplantation technique when applied to man as eugenics, since eugenics sets itself the goal of changing and improving the nature of mankind as a whole, while the nuclei transplantation technique does not change anything. It only preserves that which already exists, since it is aimed at increasing the number of highly gifted persons but not at interfering with their genetics. Besides, it does not concern entire humanity, but only certain individuals. Here, though, a number of social and ethical problems and complications arise. Do we have the right to interfere with the system of nature and artificially prolong the life of a genetic combination which is naturally destined to die away together with its carrier? Has a woman the right to bear a child who is genetically not her own? And how should such "twins" be brought up? Should they from the start be oriented towards a certain field of knowledge? And, finally, can the nuclei transplantation technique be used to the detriment of humanity? Would we not as a result create a select elite, and would not its emergence oust ordinary people, i.e. those who have been born in the ordinary way? While regarding these apprehensions as well-grounded, Neifakh nevertheless thinks they can be ignored, because it is difficult to judge which is worse: to halt progress or create new sources of concern for mankind. There is a certain risk and danger, no doubt, but positive aspects are manifest too; though of course, the application of the nuclei transplantation technique is a matter of the future.

Academician N.P. Dubinin expressed a radically different view. He said that the technique used in the selection of animals is absolutely useless in the case of genetic improvement of human beings. Of course, people do differ in genetic terms. But

should we try to eradicate this variability? Indeed, the genetic stability and potential of mankind as a whole may well be rooted precisely in this variability. Even if we evolve a model of human personality and attempt to reshape all people according to it, we could hardly achieve success, because we are absolutely ignorant of the genetic ground of human personality. In Dubinin's opinion, it is the social responsibility of a scientist, rather than an attempt to evade heredity problems, that is manifested in his realization of the inadmissibility of incompetent interference with the mechanism of human heredity. However, we cannot reject the theoretical possibility of controlled modification of human heredity in the future.

Academician Dubinin sharply criticized the views supported, in particular, by Neifakh, declaring that they rely on exaggerating the role of the genetic programme to the detriment of the programme of social heredity. Neifakh's notions about the consequences of the abstract possibility to produce human beings from somatic cells, are erroneous, for he interprets the future of mankind and the role of individual geniuses in history simplistically. Attempts to create a group of people with a biologically grounded ability for highly intellectual activities would be fraught, in Academician Dubinin's opinion, with a serious violation of man's social system. No matter for what purposes such biologically specified groups be intended, their appearance would invariably result, on the one hand, in the emergence of a closed caste and, on the other, in the standardization of people. The evolution of science is not to be curbed, concluded Academician Dubinin. In the future, people will attain unheard-of power over nature, but this will occur without creating biologically differentiated groups.

Psychologist A.N. Leontiev noted that, regrettably, in many works dealing with human genetics, objective consideration and thorough analysis of psychological factors are replaced with their superficial interpretation. For example, the data obtained by psychological studies of monovular twins allegedly testify to the fact that they possess many similar psychic traits. However, it is not so in actual fact, since the similarity is found only in the most primitive psycho-physiological properties, and even then with substantial reservations. Leontiev emphasized that psychological processes and psychic peculiarities of man take shape as a result of his assimilating achievements of the

socio-historical evolution of mankind, which are transmitted in the form of phenomena of the material and spiritual culture, rather than in the form of their genetic "record". He also opposed several other theses presented by Neifakh, in particular, his idea that humanity's creative potential is determined by the elite possessing a "happy combination of genes". Leontiev noted that, despite all reservations, this way of thinking objectively leads to a revival of pseudo-biologism in the theory of man and society's creative potential.

Biologist A.A. Malinovsky, too, expressed a point of view widely apart from that of Neifakh. He stated that if one day it is possible to reproduce genetic twins, i.e. make hereditary "copies" of talented people, to do that would be a mistake, since there are much more talented people than we know of, only their talents are realized much too seldom, even in favourable conditions. The task we are faced with today is to realize the existing potential of talents. Hereditary giftedness is no doubt important, yet hereditary prerequisites should be distinguished from social categories. In Malinovsky's opinion, it is necessary to demarcate two trends in eugenics: first, the scientific and humanist trend (based on the dissemination of knowledge and the principle of voluntariness – this trend promoted the emergence of medical genetics) and, second, the reactionary trend which found its fullest development in Nazi Germany. As a rule, we associate eugenics with the second trend. This is an error, however, since the content of this word is by no means to be reduced to the horrors linked with Nazism.

Geneticist V.P. Efroimson supported the idea that genetic factors of the manifestation of psychical peculiarities of man – talent, inclination to crime, etc. – are of much greater significance than it is usually thought. In his opinion, genetics plays no less a role than the environment in the overall characteristics of intelligence. In a number of his other statements, among them at the round table organized by *Voprosy filosofii,* he insisted that eugenic measures be necessarily applied, since the absence of natural selection has been telling negatively on mankind's heredity.

Geneticist K.N. Nazarov noted that Neifakh dwelled on one of the aspects of man's vegetative duplication – artificial reproduction of highly developed persons. But this technique can also be used for preventing hereditary diseases. He disagreed

with Academician Dubinin who asserted that no accumulation of harmful mutations is observed.

Philosophers A.F. Shishkin and M.K. Mamardashvili focussed on the social and ethical aspects of the problems under review. Lawyer V.N. Kudryavtsev expressed a negative attitude to all projects for "improving" the human race. He sharply opposed those who were apt to overstate the role played by the biological, in particular, genetic factors in the social behaviour of an individual.[12]

Geneticist N.P. Bochkov emphasized that the struggle for healthy heredity must become part of human hygiene in a broad sense, and not be reduced to the elimination of mutational factors or to lessening the rate of the spontaneous mutational process. At the same time, he noted, very important questions arise in this connection. How should the struggle in the name of healthy heredity be waged in order not to do harm to the mechanism of heredity, an extremely subtle human trait? What should be characterized as an ignorant interference in human heredity, and what should be regarded as criminal non-interference? Bochkov disagreed with those who underestimated the importance of the initial material foundation of man's evolution and reduced everything to upbringing and education. As to eugenics, he expressed his doubts whether the term will survive at all, because too many different interpretations of it are in current use and it often arouses dubious implications. He also said that the medico-genetic measures, aimed at lessening the load of pathogenic mutations, should concentrate on reducing to nought all newly arising mutations. The already existing mutations constitute a much more complicated issue, he said, because complete elimination of the mutations can lead to decreasing the variety of individuals and hence to lowering society's intellectual potential, in case mutant genes provide for certain advantages in the heterozygote state (given the heterogeneity of the heredity foundation – the genotype). Hence the conclusion that, until society attains a certain stage of development and genetics fully cognizes the genotype of man, no mass interference in human heredity should be allowed.

The discussion of philosophical and sociological problems involved in human genetics, which was

sponsored by the *Voprosy filosofii* journal, met with a wide response among both geneticists and philosophers.[13]

Marxist geneticists and philosophers, in particular those from socialist countries, occupy clearly defined ideological and methodological positions in respect to all kind of projects to "improve" the human race, connected with cloning and genetic engineering. While resolutely rejecting these projects, they at the same time support some concrete studies in the field of human genetics. There is, of course, a certain divergence of opinion within the scientific community in the approach to concrete problems, but the controversies that arise from time to time are overcome in debates based on the results of relevant investigations.

Noteworthy, the positions of Marxist geneticists and philosophers on the one hand, and of some Western scientists on the other, differ substantially in their ideological and methodological approaches to problems of genetic control, cloning, etc., and in particular as concerns eugenics and its contemporary varieties. Many Western scholars, though, also reject scientistic, manipulatory ideas and emphasize the decisive significance of ethical principles necessary to regulate research into the genetics of man, but from different philosophic positions.

There is a considerable group of those who resolutely oppose any interference into the genetics of man, who consider this trend of scientific research immoral and dangerous for mankind and categorically demand it to be banned. This point of view, expressed as a rule by people far removed from

science, cannot win many followers among the scientific community. As a result, the most widespread and authoritative position in the West is the one which favours the idea of genetic control, but only within certain ethical bounds.

This position has been dealt with at length by Joseph Fletcher in *The Ethics of Genetic Control*. The author is a distinguished theologian and an expert in problems of medical ethics. He supports the idea that value judgements should not be confused with those immediately deduced from knowledge. Therefore, he says, all that exists in science is not necessarily good or desirable for people. Yet we cannot act in science without formulating our attitude towards its results, in particular, from the point of view of ethics. Guided by such arguments, Fletcher tries to analyze the situation arising in connection with the revolution in biology and those avenues which are opened up in the field of genetic control.

Fletcher regards as justifiable any genetic control, because it frees mankind from genetic malformation and diseases. Today, man finds himself in a Promethean situation: he wants to steal the sources of power from the gods and at the same time tries to predict what consequences will result from the use of this power. The realization that, for example, creation of human beings by simple cloning is inevitable, radically changes, in Fletcher's opinion, our perception of the reality and the principles by which we are guided in our life, as well as all our concepts. He ruthlessly criticizes the "conservatives" who propose that research into genetic engineering, cloning, etc. be banned or curtailed, or that a moratorium be imposed on them. In his opinion, the argument that the obtained knowledge may be used to the detriment of man is not valid since in that case it is

a matter of politics, and not of biological science. He rebukes with equal sharpness both those who are in favour of genetic control without any restrictions and those who reject such control offhand. He thinks that, while genetic "control works", "suppression will not work", and that the period of man's submissively "'taking what you get' by way of random or lottery conceptions" has gone forever, being replaced with the period of "selective genetic and fetal engineering", whose technique, while being artificial, "is still entirely natural" and "supremely human – humanely motivated and humanly manipulated".[14]

Fletcher tries to refute the arguments of those who accuse supporters of genetic engineering and reproduction by cloning of destroying the family, of dehumanization and depersonalization of man, and generally of undermining all respect of life. He states that the very concepts about the family, man and life must be substantially modified, and corresponding changes must take place in ethics. Even the eternal biblical "truths" are taken to task, though one of them – concerning Immaculate Conception – is regarded as a "prototype" of clonal reproduction.

Fletcher draws a strict line between biology and genetics, which are both busy solving the question of how to implement genetic control, and the sphere of ethics, which is engaged in analyzing the essence of this procedure, its value for man. He develops the idea that any means is justified if it serves to attain a goal which has been set and approved; if this harmony is violated, however, the same means is regarded as inadequate. In fact, this approach destroys all obstacles and restrictions in the path of scientific study of man and genetic control, and first of all those of an ethical nature. It is not fortuitous that Fletcher has to resort to a "pragmatic-instrumental" argument – comparison and evaluation of the alternatives to genetic control. He needs a narrowly pragmatical ethic which would suit the present moment; all the rest is empty metaphysics and phraseology to him. By taking upon himself the burden of moral responsibility for his own fate (previously, that burden rested with God), man must free himself from all kind of ideologies with their plans of modelling man according to ideal moral principles, sanctified by "God's will", "human rights" or "historical necessity", and advance along the road of gradual, step-by-step engineering, relying on experiments and investigations, and in compliance with the principle of humanism.

Fletcher deals very resolutely with the moral experience accumulated by mankind in the course of the historical evolution of social practice and analyzed by philosophical means; he thus turns scientific and technological achievements into the chief criterion of human goals and values. True, in the course of scientific and technological progress, situations often emerge in which ready-made answers based on past experience, are not appropriate. Yet, by drawing on this experience, we can borrow from it the humane principles and ideals, which will come in handy in our search for the answers. The fact that in times bygone ethical norms were based on God's will or on the authority of the Gospels, is not sufficient ground for nihilistically rejecting these norms, because they contain, though in a somewhat distorted form, the rules of community life and joint human activities, which were worked out by society itself. Ethical relativism, which logically stems from Fletcher's position, is not an insurmountable obstacle in the path of scientistic manipulations with the rights and dignity of the individual. It does not contain anything which can be used to oppose the theses of technocratic determinism which Fletcher himself holds as erroneous.

As we have seen, Fletcher does not suggest anything concrete by way of analyzing realistic ethical problems. He does not consider either genetic engineering or cloning or genetic control in general from an ethical angle. It is rather the other way round: he assesses ethics, its individual norms and principles from the angle of genetic control, which is justified from the start.

Discussions on genetic control issues have been given a new impetus over the recent years, in connection with the fact that the possibility of practical utilization of genetic engineering technique in treating hereditary diseases, has become a reality. According to Johannes Reiter,[15] gene therapy consists in the introduction of genetic material into an organism with the purpose of eliminating defects. Three ways of doing this are possible: (1) gene insertion, i.e. introduction of a new, healthy variety of the same gene into the cell with the defective gene; (2) gene modification, i.e. changing of the existing gene; and (3) gene surgery, i.e. removal of the defective gene and its replacement with a normal one. At present, the technique of the first type is practically usable: it is already applied in the gene therapy of somatic or germ-cells in the diseases caused by the defect of a single gene, inherited recessively—for example, in the Lesch-Nyhan syndrome and also in some diseases caused by immune deficiency.

Reiter thinks that an a priori rejection of gene therapy would be a mistake in terms of ethics, though he agrees that extreme caution and responsibility are a must in this field. Inasmuch as gene therapy is directed at curing diseases, the risk of its misuse is limited. Yet gene therapy can also be used to evolve a super race or monsters, which is usually referred to as positive eugenics.

Some scholars and religious figures generally oppose application of genetic engineering technique to man; they say there is a boundary beyond which it can get out of hand. However, those suffering from hereditary diseases continue to place their hopes

upon gene therapy. O. Huntley, who has three children suffering from sickle-cell anaemia, expresses her dissatisfaction that there are people who oppose the application of gene therapy to her children; she says they are overexcessive moralists.[16]

While thinking that the gene therapy of somatic cells can be allowed, Reiter at the same time is critical in respect to the gene therapy of germ-cells. First, in the gene therapy of germ-cells, an error may easily be made as a result of which a living being can appear, in whom one defect would be eliminated, but another, and even more serious one, would emerge; moreover, it would be transmitted to the future generations. Second, the gene therapy of germ-cells violates the fundamental right of an organism's inviolability for it is a manipulation with the identity of human personality. Third, this technique could be a decisive step to the evolution of the so-called "improved" man. Finally, to develop the gene therapy of germinal cells, it is necessary to carry out experiments on human embryos which are in themselves doubtful in ethical terms.

Le Roy Walters,[17] Director of the Center for Bioethics at the Kennedy Institute of Ethics, Georgetown University, and one of the leading US experts in the ethics of biomedical studies, is more favourably disposed towards human gene therapy of germ-cells. While saying that this method of therapy is as yet beyond the powers of the available technology, he nevertheless considers it relevant to discuss its ethical aspects, since such discussion will make it possible to lay the ground for decision-making in this area in the future.

Argumentation in favour of the gene therapy of human germ-cells, given by Walters, is as follows: first, its greater efficiency compared with the therapy of somatic cells, because it excludes transmission of defective genes to the progeny, and, second, the fact that certain genetic diseases can only be cured through the gene therapy of the germinal tract. But Walters also notes the following circumstance: new genes are introduced, given the modified gene therapy, by means of a vector, whose part is played by a weakened retrovirus. Thus, there is a danger that this vector will recombine with the gene structures of the recipient cells and will cause an infection; besides, the vector-gene combinations may invigorate the formerly passive protooncogenes and destroy the normally functioning genes.

Thus, as biomedical research advances, problems of the ethics of genetic control are filled with a new and more concrete content and assume considerable practical significance. The issue of the ethical regulation and substantiation of investigations in human gene therapy is now on the agenda.

In this connection, a more general question again arises: can science be self-regulated on the ethical level and to what extent is it capable of self-control? Indeed, even in case scientifically based principles of ethics relying on a concrete interpretation of human benefits are applied, it still remains unclear how they will operate, and how the "feedback" and control over the compliance with these principles will be ensured. Evidently, everything which has anything to do with the realization and, in fact, the elaboration of ethical principles of science, with its

value (including ethical) orientation, is underlied by social factors, which are widely diverse and even opposite in different and opposing social systems. This is why the search for moral regulations that would be of universal character and would operate automatically as the chief regulator in science, including in the research and practice of genetic control, is at the very least impracticable. This is recognized by the scientific community in capitalist countries, where more and more often the scientists raise the question of a social regulation of investigations involved in genetic control.

This trend is clearly revealed in Amitai Etzioni's book, *Genetic Fix,* in which the issue of increasing the sense of responsibility in scholars working in the sphere of genetic control, is put very sharply.

The book is written in the form of a detailed report on the conference of the Council for International Organizations of Medical Sciences (CIOMS), sponsored by the World Health Organization and UNESCO in Paris in September 1972. Its topic was "Recent Progress in Biology and Medicine: Its Social and Ethical Implications". Etzioni writes: "Many viewed biological engineering in the same way they viewed other scientific advances – as one more giant step in the development of modernity toward ever-greater opportunities and ever more freedom of choice in an ever more modern world. But this development, it seemed to me, would, by requiring conscious selection of what has heretofore occurred naturally ... almost surely overwhelm the human capacity, already severely taxed, to make sensible choices... Even before we have learned to cope with the endless dynamism of our society and culture, we now face efforts to 'temporize' our bodies."[18]

As a result, complicated problems appear involving the social responsibility of scientists. But the contemporary capitalist society has no social institutions, Etzioni goes on to say, which could ensure an effective and flexible regulation of scientific in-

vestigations and would help reduce the frightening gap which has formed between the interests of scientific development and its socio-ethical implications. This is why Etzioni speaks of "a sentimental, but not viable, 'sense of responsibility' which, God knows, we need, but also one which requires a set of institutions to back it up".[19] Etzioni does not give an answer to the question, which would be the form of such regulation, but he places accent on the problem, and this is important in itself.

Etzioni thinks that the growing of babies in laboratory test-tubes and their subsequent adoption can be permitted, since it does not necessarily undermine the mainstays of the family. He favours genetic consultations, though he admits that they will hardly bring any benefit to the poor, who are less informed and are not in the habit of asking for medical advice. He supports diverse forms of genetic control and does not think that there exist areas of scientific research that should be restricted. In his opinion, on the one hand, we should not exaggerate dangers involved in the studies of man, in particular, in genetic studies, but on the other hand, we should give thought to them today, when many of the probable threats have not yet become reality, and those that already exist, have not yet assumed formidable proportions.

Under the conditions obtained in capitalist society, however, all attempts at making and, the more so, implementing a practical decision in this sphere, confront numerous obstacles of a principled nature; they are connected with the specifics of this kind of society in which selfish, egoistic interests of the exploiter minority, rather than the general welfare, are given priority. Social antagonisms account here for extreme contradictions in formulating and tackling problems of the regulation of scientific research, especially in the field of biology and human genetics.

Under socialism, scientific and social goals and means coincide in principle, and this fact provides

for the coincidence of the scientists' research and ethical purposes, and for a dialectical interdependence of freedom of research and social responsibility, which in capitalist society are wide apart and often cause acute antagonisms, bringing sufferings to the scientists and fraught with dangers for society. Thus, socio-ethical levers of scientific research do not seem to be an outside control to scholars in the socialist countries, but are seen as ethical principles, inherent in science as a social institution. This is not to say that in the socialist countries, the contradictions and problems arising in connection with the realization of these principles are automatically eliminated. But in the final analysis, they are resolved in a rational way, beneficial both to the interests of scientific cognition and of society. Harmony between the scientific and social goals and means under the conditions of socialism serves to ensure broad opportunities for scientific quests, particularly in human genetics. However, these opportunities can only be realized gradually, as science and socialist society itself advance and a new person is shaped, and as his cultural standards and self-consciousness, including in the social and ethical spheres, in everyday life and family relations, improve. Socialist society, its philosophy and ethics make a manipulatory approach to man impossible, in particular, if it is linked with the application of the technique of genetic control.

Relying on these principles, socialist countries intensify their all-out cooperation in the field of biological and medical studies of man with all countries in the world. While being fully aware of the threat

presented by uncontrolled activities in the given branch of science and the global nature of many problems involved in it, socialist countries participate in numerous international law agreements on the regulation of scientific studies of man. They put up vigorous struggle against possible detrimental uses of the results of such studies for military purposes, and for banning the development of new biological weapons, which would be even more destructive than the nuclear weapons already in existence, and for the creation of which the techniques employed in genetic engineering can be used in principle.

Man's reason and humanism must by all means prevail. The rapidly expanding worldwide movement of all reasonable and progressively-minded scientists for establishing more reliable socio-ethical, humanistic control over scientific investigations and their technological uses, gives us grounds to assert that. The socio-ethical, humanistic regulation of science, which is actually a vital requirement both of the scientific community and society as a whole, can usher in a new stage in the evolution of science. The scientists' responsibility before society and the freedom of scientific inquiry are not mutually exclusive. This is ever more profoundly realized by contemporary scholars, as is reflected, in particular, in numerous movements organized by the scientific community and inspired by the idea of a humanistic, socio-ethical regulation of scientific research. This situation gives rise to new practical opportunities for a dialogue and joint action within the framework of the world scientific community in the

conditions of peaceful coexistence and mutually beneficial scientific cooperation.

NOTES

[1]David Baltimore, "Limiting Science – a Biologist's Perspective", in: *Limits of Scientific Inquiry,* ed. by Gerald Holton and Robert S. Morison, W.W. Norton and Company, New York, 1979, p. 39.

[2]Ibid., p. 40.

[3]Erwin Chargaff, "On the Dangers of Genetic Meddling", in: *Science,* Vol. 192, No. 4243, June 4, 1976, p. 938.

[4]Ibid., p. 940.

[5]Paul Ramsey, *Fabricated Man. The Ethics of Genetic Control,* New Haven, Yale University Press, 1970, p. 9.

[6]Ibid., p.10.

[7]Charles Frankel, "The Specter of Eugenics", *Commentary,* Vol. 57, No. 3, March 1974, pp. 25-33.

[8]*The Cloning of Man: A Brave New Hope – Or Horror?,* ed. by Martin Ebon, Signet Books, New York, 1978.

[9]David M. Rorvik, *In His Image,* J.B. Lippincott, Philadelphia, 1978.

[10]*The Cloning of Man: A Brave New Hope – Or Horror?,* p. 168.

[11]See *Voprosy filosofii,* No. 7. 1970; No. 12, 1971.

[12]For detail, see: N.P. Dubinin, I.I. Karpets, V.N. Kudryavtsev, *Genetics, Behaviour, Responsibility,* Moscow, 1982 (in Russian).

[13]See: *Society and Man's Health,* Moscow, 1973 (in Russian); Hans-Martin Dietl, Heinz Gahse, Hans-Georg Kranhold, Humangenetik in der sozialistischen Gesellschaft. Philosophoctische und soziale Probleme, Fischer, Jena, 1977; *Der Mensch. Neue Wortmeldungen zu einem alten Thema,* Dietz Verlag, Berlin, 1982; *From Biology to Biotechnology,* Brno, 1981; *Philosophische Aspekte der Biologie,* Jena, 1982; I. Kalaikov, *Social Progress and the Biology of Man*, Sofia, 1982 (in Bulgarian); *Dialec-*

tics in the Sciences of Nature and Man, Vol. 4, Moscow, 1983 (in Russian).

[14]Joseph Fletcher, *The Ethics of Genetic Control. Ending Reproductive Roulette,* Anchor Press/Doubleday, Garden City, New York, 1974, p. 36.

[15]Johannes Reiter, "Gentherapie und Ethik", in: *Stimmen der Zeit,* Verlag Herder, Freiburg, Vol. 203, No. 9, 1985, pp. 580, 581.

[16]*Science,* Vol. 227, No. 4686, February 1,, 1985, p. 494.

[17]See: Le Roy Walters, "The Ethics of Human Gene Therapy", in: *Nature,* Vol. 320, No. 6059, 1986, pp. 225-27.

18Amitai Etzioni, *Genetic Fix,* Macmillan Publishing Co., Inc., New York, 1973, pp. 22, 23.

[19]Ibid., p. 36.

CHAPTER 8

Summary and Conclusions. The Ethics of Science as a New Field of Research. New Problems and New Debates

We have presented in previous chapters the problems around which most debates of a socio-ethical nature are centred today. We shall now attempt to outline the ethics of science as a newly-emerging scientific discipline, to identify its specific problems and show probable ways of its future development. The following points should be emphasized in this connection.

The ethics of science can develop only in close contact with the methodology, history and sociology of science, and with other fields of scientology, using the methods and concepts they have elaborated and in its turn contributing to more realistic, broader and better substantiated concepts of scientific knowledge and scientific activities. Furthermore, there is no sense in formulating anew the problems of the ethics of science, since they have already taken shape and continue to develop. Numerous debates testify to that, as their participants inexorably pass over from discussing concrete ethical problems, cropping up in certain directions of modern science, to more general problems, pertaining to the

ways in which science develops in constant interaction with society.

This conclusion is prompted by the historical process of scientific development, the strengthening of ties between science and society and the extension of the social functions of science. Analysis of the evolution of the self-awareness of science, including the evolution taking place in the content of problems discussed within the framework of the ethics of science (as presented in previous chapters), leads us to the same conclusion.

Interest in the ethical problems of science arose long ago, but over the recent 10 or 15 years this field of scientific study has been seen in a new light. The number of studies of the ethics of science increased considerably, and more problems were analyzed. Notable shifts also occurred in the approach to these problems and in the character of the debates.

Up to the mid-20th century, problems of the ethics of scientific knowledge were not, generally speaking, an object of systematic study. They were discussed only from time to time, and sometimes such discussions amounted to moralizing and were mostly regarded as purposeless and rather incoherent deliberations, which were usually poorly linked with the real practice of scientific investigations. Ethical issues and evaluations only concerned science as a whole, and thus could not have a direct impact on the activity of a specific researcher, on the formation of his scientific interests. It would be a mistake, though, to regard them as altogether useless, since they played a considerable role in the emergence and development of modern science. In-

deed, in the course of this process, science was to be given a moral sanction as a social institution and a specific area of activity.

Socrates in his time said that man performs evil deeds only because of ignorance and that, once he learns of good, he will always be striving for it. Thus, knowledge was recognized as a condition—and an indispensable one at that—for a virtuous life; a quest for knowledge was also presented as a virtue. In the subsequent history of philosophical thought, various interpretations were given to knowledge and what should underlie the process of cognition. Though actual stress on the possession of knowledge and truth changed, the demand that truth be virtuous remained in force. Such a high evaluation of knowledge found most vivid expression in the Enlightenment and Utopian philosophers, who saw the reason for human and social vices in ignorance and regarded its eradication as the primary and sufficient condition for creating an ideal social order.

Science's advance in modern times largely depended on the joint influence of many factors and phenomena, and the fact that scientific knowledge was increasingly interpreted as a morally approved activity played not the least role. Today, as the social functions of science rapidly multiply and become much more diversified, and the number of channels linking science with the life of society constantly increases, debates on the ethical aspects of science remain an important form of revealing and analyzing its modified social and value characteristics. However, attempts to give an undifferentiated, summary assessment of science as a whole—irre-

spective of whether this assessment is positive or negative – prove to be increasingly insufficient and unconstructive. The stages of scientific and socio-cultural development when the need for the very existence of science as a social institution was put in question, are now a thing of the past, and this makes neo-Rousseauist and anti-scientistic trends of social thought unproductive. This is not to say, however, that science in general can no longer be an object of ethical assessment and the only thing remaining for us is to bow down before scientific and technological progress, trying to adapt ourselves to its manifold implications which are far from always beneficial for the human race. Yet the assessment should be more differentiated, and should refer not only to science as a whole but also to individual lines and fields of scientific knowledge. It is here that moral-ethical judgements expressed by scientists and the public can, and actually do, play a serious and constructive role. The scientific community has not become aware of the fact overnight, but only as a result of a long historical development, in the course of which it knew success and great expectations, and also defeats and disappointments.

In speaking of this – sometimes painful and even tragic – experience, we must emphasize that it renders a different dimension to the debates on socio-ethical problems involved in science, and puts the question of the borders between the "internal" and "external" ethics of science on an entirely new plane. It becomes clear that the "internal" ethics of science is unable to provide scientists with a dependable reference point to guide them in the ocean

of unknown phenomena, never deviating from the genuine goals of science and its humanistic thrust. The German physicist, Max Born, wrote in his recollections, *My Life and My Views*, that the pursuit of knowledge brought him personal satisfaction and even happiness. However, he continued, "in the operation of science and its ethics a change has taken place that makes it impossible to maintain the old ideal of the pursuit of knowledge for its own sake, which my generation believed in. We were convinced that this could never lead to any evil since the search for truth was good in itself. This was a beautiful dream from which we were awakened by world events."[1]

Born refers to the well-known events in modern history, and first of all, to the US atomic bombs dropped on the Japanese cities. We have already noted that after these events the issues of the impact exerted by scientific discoveries on the life of society, of the social implications of scientific and technological development, became an object of constant and close attention on the part of progressively-minded scholars, who began to join *en masse* the struggle for peace and disarmament.

The ecological movement which emerged in the early 1960s aroused public concern with the growing pollution of the human habitat and exhaustion of the globe's natural resources, as well as the general exacerbation of global problems. It is relevant today to recall that it was the social responsibility of scientists that became a starting-point for the scientific community and then the public at large to realize the gravity of the potential threat to the future of

mankind. In this case the scholars' responsibility was announced even before the situation as a whole became irreparable. When atomic bombs were exploded over the Japanese cities, only representatives of certain branches of physics were party to the tragic events. The ecological movement, however, embraced all branches of science, involving representatives of the most variegated departments of natural, social and exact sciences. It is also noteworthy that scholars joined the ecological movement not only because of their social but also because of their purely scientific interests. Thus, a considerable share of contemporary scientific investigations – and not only applied but also fundamental – are devoted to various aspects of the man-environment problem. Thus, the social responsibility of scientists proves to be not an entirely external factor in respect to the trends observed in the development of science, individual scientific disciplines and lines of research.

Let us recall one thing which has been discussed in detail in the previous chapters, i.e. the course of events that took place in genetic engineering. The issue under discussion was the ethical norms and regulations which could exert an influence both on the direction of research and the process as such.

The debates analyzed earlier testify to the fact that the ethical problems of science become ever more concrete and clearly defined, and the ethical self-awareness of a scholar appears (though far from always in bold relief) not as an optional additional element to his professional activity, but as one of its components. Problems of the ethics of science are not only being specified. They are in a certain sense

generalized, emerging in various spheres of scientific knowledge. There is no branch of science which would be guaranteed against these problems, which are anything but simple.

Typical in this respect are the debates, expectations and apprehensions aroused by the advance of microelectronics and informatics, often called by the single term of the computer revolution. The rapid growth of cybernetics and computer technology, and a broad introduction of robots and computers not only into production but in the most diverse spheres of the life of man and society, raised quite a few unexpected and vital questions concerning the freedom and sovereignty of an individual, and the destiny of democratic social institutions. Many of these questions were analyzed by Norbert Wiener, the founder of cybernetics.

As they ponder over the prospects before humanity, opened up in connection with the ushering in of an era of robotics and informatics, scholars and philosophers today raise the issue of so-called contiguity, i.e. they emphasize that a new and higher stage of the evolution of society and man himself, in their interaction with nature, must correspond to the new and higher level of production technology.

Biotechnology evolved more or less parallel with the development of informatics and robotics until they intersected, thus opening new prospects and offering new opportunities to humanity. Of course, the emergence of cybernetics was underlied by the euristic utilization of the man-machine analogy, and the study of many physiological mechanisms of man's mental activity provided the foundation for

developing ever more perfect computer generations, including robots, and attempts at creating artificial intelligence. But it was only in the 1980s that production technology was really biologicized, coupled with microelectronics in the new computer generations. Entirely new prospects appeared in the science of life, started by the rapid advance in physico-chemical biology and molecular genetics, which in turn led to the emergence of genetic engineering. At the subsequent stages of this period of the scientific and technological revolution, when science really enters the "age of biology", new discoveries at the interface of microelectronics and genetic engineering will probably occur. This may give rise to a still newer branch—bioelectronics, which will enable man to build new systems capable of human-type "thinking".

What implications will this have for man himself and for society he lives in, and what social and personal problems arise in this connection even today?

Bourgeois futurologists maintain that a capitalist-type industrialized society will inevitably turn into an "informational" one, and the main problems the capitalist world faces today will be resolved by that society. However, the measures launched within the limits of the existing capitalist structures cannot cope with the complex socio-economic problems triggered off by a wide use, today and in the future, of new technology affecting production relations and the entire system of social interconnections. The realization of this fact underlies not only the optimistic, but also the pessimistic tone of many Western prognoses, including technocratic futurology.

Many of the futurological theoretical constructions take into account realistic problems and the need of "high-level contiguity" between new technology and social structures, and conclusions are at best social-reformist in nature.* They are wide apart, of course, from frankly apologetic conclusions, and therefore the Utopia of an "informational society" reflects, albeit in a somewhat distorted form, real alternatives to be faced by the future human civilization. In dealing with new technology and its impact on the evolution of society, a social road into the future is suggested which would exclude the prospect of socialism and communism; thus it leads mankind away from a real "high-level contiguity", which is sorely needed by technology today and which will be needed by it as badly in the future. New technology really needs a new society and a new civilization.

Socialist countries have in recent years made energetic efforts to intensify social production through the introduction of achievements of scientific and technological progress, primarily microelectronics, informatics and biotechnology. Resolutions of the

* For example, at the "Co-evolution and the Age of Robots" symposium (Paris, 1984), sponsored by the Institute of Life under CESTA, the Center's Director G. Robin arrived at a conclusion in his report, which contained interesting facts and ideas, that to avert negative socio-economic implications of new technology, it is necessary to design a new society that would be socially differentiated, not by traditional classes but by the degree of adaptation of certain groups of people to new technology. He insisted that such an adaptation was necessary on a world scale, and his opinion was shared by many other reporters and participants.

Central Committee of the CPSU and the Soviet Government, in particular, on developing microprocessor technology, production of robots and ensuring progress in biotechnology, gave a powerful impetus to advancement at the new stage of the STR. The new edition of the CPSU Programme states that "electrification, chemicalization, robotization, and computerization of production will be effected and biotechnology used on an increasingly large scale".[2]

New technology's "high-level contiguity" with society, presupposes a high standard of culture and man's creative abilities in their integral, harmonious manifestation. That contact must be organically built into the new scale of values born of a new understanding of what is the meaning of human life, and of assessing all phenomena, including high technology itself, in conformity with the fact that man and his development are the measure of all things and the final goal of history.

This circumstance assumes special importance at the present stage of civilization when man enters the age of electronics, informatics and biotechnology. Acute social and human problems loom large, related to the realization of opportunities offered by high tech without detracting from the meaning of human existence in the world of robots which are increasingly "ousting" man from immediate participation in production and freeing him not only of routine, tedious labour operations, but also of all other operations in which machines simply excel man. In the West, this is often made the object of various socio-philosophic experiments which leave far be-

hind the fantastic imagination of Karel Čapek, who was the first to launch into current use the term "robot" (in his play, *R.U.R.—Rossum's Universal Robots).* There are all kind of classic anti-Utopias and modern specimen of mythology intended either to frighten man, who loses his bearings and is alienated from society and who is unable to comprehend, in particular, the meaning and significance of high tech, or to instill in him exaggerated hopes and illusions which in fact amount to consumerism. Thus, following the Canadian sociologist, Marshall McLuhan, Western futurologists raise a hue and cry about the "decay of humanism" and describe the mass media as working deep changes in human nature. The mass media and technology are regarded as a physical, materialized reality of culture, and ideology—as only a decoration, an official uniform donned by the media. The futurologists are seriously debating whether it is possible to use the media for changing human physiology, its organic functions. Neo-eugenic ideas about a fabricated man (*Homo sapientissimus*) and even about a biocyborg (*Machina sapiens)* are being renovated and clad in a new attire, drawing on the infinite opportunities offered by microelectronics and biotechnology.

At the same time, there is a growing realization—more often than not in an abstract-utopian form—of the need for a high-level contiguity of new technology with man and new-type humanistic values, which cannot be provided under capitalism and which comprise the base of communist civilization. Western literature emphasizes the significance of socio-psychological and cultural-ethical problems

that would inevitably accompany the process of robotization. Though the concept of high-level contiguity (contact) in its narrow sense characterizes man-machine interaction, in which the computer, being a "delicate" machine, makes quite a few demands on man, including rejection of certain of his habits (smoking, etc.), it mostly concerns indispensable phenomena, such as a higher standard of professional knowledge, general culture and morality. Sometimes, voices are raised in favour of creating a special field of so-called applied philosophy, or computer ethics. It is the subject of discussion at various conferences and symposia. Research centres are established, and courses of lectures read on this subject at many institutes in the West.*

Many Western scientists endowed with a keen insight have become increasingly convinced of the fact that existing economic models cannot reflect the real situation in all its complexity and that the model of a new type must include not only a non-material information sector, but also non-material aspects of

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* The subject-matter of computer ethics can be judged from the materials on this topic collected in the journal *Metaphilosophy* (Oxford, England, Vol. 15, No. 1, 1984, pp. 64-76). Described there are crimes committed with the aid of computers, the issues of preservation of personal freedom and the responsibility of scientists and technicians engaged in designing and applying computers. These problems came into the limelight, in particular in the USA, in connection with the project to set up a single data bank, which would contain full information on every US citizen. Congress had to decline the project because of the vehement protest of the public, yet this method is widely applied, for example in police surveillance, including on political grounds.

human activities, as well as its interaction with the environment.[3]

US sociologist, Alvin Toffler, writes about this in his book, *The Third Wave,*[4] and the authors of the report to the Club of Rome, *Microelectronics and Society. For Better or for Worse*[5] also emphasize this fact in dealing with human aspects of the introduction of high technology. They not only speak of the advantages, but also disclose the disadvantages (control and observation not only over the behaviour, but also over the thoughts of people; the possibility of the emergence of a new technocratic elite; isolation and insidious alienation of individuals "with loss of human dignity and self-esteem", etc.). The authors of the report attempt to oppose to this gloomy picture a fine Utopia of their own vintage. However, they are themselves doubtful whether man can continue to develop further as a creative being and resist degradation if he is freed of the need to work, since work in their opinion will become a privilege of a few select persons as a result of the robotization of production.

The picture they have painted is no doubt a Utopia, and it is far from being a fine one, as they claim it is, if we take into account the reality of capitalist society. Humanist problems, which are growing increasingly acute due to wide-scale applications of high technology in production, can only be resolved if radical social changes are effected in the direction of socialism and communism – a genuinely humane society.

In this type of society, man at last enters the "human age". He is not "ousted" from production as a superfluous element to swell the ranks of the unemployed but is offered an ever growing opportunity to approach it in a creative way, really making it serve his own material and cultural needs, and also to develop all his other talents outside the

sphere of production, while handing over the latter to machines. Such creative activity of an integral, harmoniously developed person enables him to fully realize the "high-level contiguity" with the natural environment as well.

Considering all the above, we cannot assert that ethical problems are the prerogative of only some fields of science, and that their emergence is an outstanding phenomenon in its development, something of a temporary, external and accidental nature. They are becoming an inalienable and quite prominent feature of scientific activity today, and this testifies, among other things, to the fact that science continues to develop as a social institution and that it plays an ever greater and diverse role in the life of society. This is also an indicator of society's development level. Hence, the great difference between the content of debates on the relevant problems: a society, which is on a higher level of evolution, approaches science with entirely different moral-ethical criteria and demands than a society which has not yet attained that level of development.

An ethical base has always been necessary for scientific activities. However, when the results of those activities exerted an influence on society only occasionally, knowledge in general could be regarded as a boon, and scientific activities aimed at the increase of knowledge, as an ethically-justified pursuit. Today the one-sidedness of such a position has become obvious, as, generally, the abstract nature of the question, whether science is intrinsically faultless or sinful.

It would be desirable to resolve all ethical problems involved in science once and for all, by elaborating, for example, a universal code of scientific ethics. Such projects are proposed and widely discussed today. Alongside the elaboration of such codes, documents and recommendations of a more general nature are also adopted. These provide socio-ethical guidelines and principles for scientific activity (for example, the Recommendation on the Status of Scientific Researchers, adopted at the General Conference of the 18th Session of UNESCO in 1974. Numerous documents of a similar nature are put on the agenda at Pugwash conferences).

All these efforts on the part of the scientific community are noteworthy in themselves because they reflect the growing sense of social responsibility among scholars. However, as experience shows, concrete situations giving rise to ethical problems are so specific that a unified code of ready-made decisions seems to be hardly possible. (This refers not only to science, though, since history has never known any universal code of behaviour which would absolve man of the necessity to make a moral choice, when finding himself in extremely variegated situations, or of responsibility for the choice made.)

It should be added that the advance of science presupposes expansion of the scope of such problem situations in which moral experience accumulated by humanity proves to be insufficient. Let us recall, for example, how sharply the question was posed concerning the determination of the moment of a donor's death in connection with successful experiments in the transplantation of the heart and

other organs. The same question also arises when technological means are used to support breathing and palpitation in hopelessly comatose patients. In the USA, the question was raised by a commission studying ethical problems in medicine, biomedical and behavioural research, when life-support apparatuses were cut off from hopelessly ill children with their parents' consent.* The commission agreed that patients who are in a permanently comatose condition should not be regarded as dead and that death is the irreversible cessation of the blood circulation or breathing or of all functions of the brain.

Today, experiments with human embryos and foetuses render the same acuteness to the question: from which moment of embryonal (or post-embryonal) development should the embryo be regarded as a baby with all the ensuing consequences? Jacques Robert, a French lawyer, states that controversial situations emerge because of the lack of clarity on the issue of the "legal status" of the embryo: nobody knows whether it should be regarded as an independent entity or as part of a mother's body.[6] In France, for example, certain rights are legally conferred on the conceived baby, but there

* Many such cases are analyzed by US lawyer R. Thompson, who states that 15 US States have passed bills on the right to death, which are based on the legal right of a grown-up sane person to refuse taking life-support medical procedures if he has an incurable disease. US citizens can make out a special will, in which they officially state their refusal to undergo medical treatment. In other States, however, refusal of a life-support medical treatment is considered a breach of law. Thus, laws reflect the uncertain situation observed today concerning the issues of ethics, life and death.

is no unanimity as to the moment from which the embryo should be recognized as a subject of law. Referring to the opinion formulated by the French Consultative National Committee on the Ethics of Sciences Concerned with Life and Health, Robert opposes the use of embryos for commercial or industrial purposes and for all kind of experiments.

It should be stressed that, though the discussions on the socio-ethical problems of science are no doubt important and urgent, they are not sufficient in themselves to elaborate the ethics of science as a special research area. A certain bias becomes graphically manifest in the course of these discussions, in their very nature. Very often, the matter is reduced to merely declaring one's own position, putting into words some emotional judgements and convictions, and giving assessments without even trying to substantiate them.

It is no doubt necessary to exchange opinions on science's ethical problems. Yet today this is not enough, because these opinions often only seem to be contradictory. To compare them in real and productive terms, and to criticize them in a constructive fashion, a different approach should be taken—to analytically divide and investigate the vast and diverse set of problems which we identify as the ethical problems of science.

After various positions have been announced and opposed to one another, i.e. after the boundaries of a discussion have been delineated, we shall be doomed to mark time if we do not try to advance in depth, towards profoundly analyzing both the controversial positions and, above all, the problems

themselves that have given rise to them. This work, naturally, is rather specific. Thus, progress will inevitably be accompanied by a narrowing down of the circle of those who have a vested interest in such an advance and are competent enough to take part in it.

Identification and study of the empirical material supplied by the evolution of science is an indispensable condition for a more concrete and thorough study of problems involved in the ethics of science. The investigation of this material will enable us to arrive at certain generalizations and identify features characteristic of a given concrete situation and a given specific field of scientific knowledge. It will make it possible to reveal intrinsic mutual ties and regularities, – in short, to approach the problems in a way typical of science in general. It is precisely in this way that the ethics of science is developing as a specific scientific discipline.

Viewed as a discipline, the ethics of science should not set itself the goal of formulating instructions valid for each particular case of research – that would amount to its substitution for a scientist himself in making decisions on ethical problems he is faced with. In our opinion, it should not be overconcerned with decision-making but should clearly formulate ethical problems and contradictions arising in the course of scientific research and reveal the social roots of these problems. It should not impose on scientists behavioural standards but rather make them critically analyze and substantiate ethical norms to be observed in practice. In the final analysis, it should deal with the investigation of the ethi-

cal content of scientific activities, which is not always clearly discernible but is nevertheless always present in them.

In this respect, the ethics of science reminds one of the methodology of science. The latter has long abstained from providing recipes for those who are searching for discoveries. It restricts itself to analyzing and substantiating the methods and processes used in science, as well as prerequisites underlying a particular stage in the evolution of scientific knowledge which are far from always obvious. Studying the norms of scientific activities, such as the historically modified standards of the profundity and substantiation of knowledge, models and paradigms to which scientists are oriented, is a key if not the chief topic of the methodology of science. The normative structure of scientific activities, considered from a certain angle, is also an object of study of the ethics of science.

The parallel we have drawn between the methodology and ethics of science can be continued. Like the methodology, the ethics of science becomes a form of a scientist's assessment of the content, social meaning, and thrust of his own activity. Like the methodology, which evolved from considering the universal and once and for all given ideal of scientific knowledge and the way to attain it to the analysis of concrete methods of cognition and concrete cognitive situations, the ethics of science today cannot be reduced to general statements related to scientific knowledge as a whole, such as "science is a benefit", "science is moral", or "science is neutral in respect to ethics".

The problems of ethics, just as the problems of methodology, face a concrete researcher as such, not merely a representative of the scientific community. They therefore demand a decision that should not be appealing to "science in general" but should be made by each scientist as the person immediately concerned. One should not be misled by the manifest disregard of philosophical and methodological problems on the part of a particular scholar, or arrive at a conclusion about the absence of a deep internal link between science and ethics on the sole ground that some scholars, even if they are quite a few, ignore ethical problems. Cardinally important in both spheres is the conception of science and its image on which a particular researcher dealing with these problems relies.

For example, if science is treated as just a system of substantiated knowledge, an individual scientist is an impersonal agent via whom an objective logic of scientific development operates. This agent – a cognizing subject – implements a cognitive attitude towards reality. This presupposes that he studies the cognized object in a "pure", disinterested and impersonal manner. Such an interpretation of science makes it possible to resolve a certain set of cognitive and methodological problems, but by no means all problems. As a matter of fact, the concept of a "pure" cognitive attitude, on which this interpretation of science is based, is an abstraction and, like all abstractions, it can only provide a one-sided notion of the object examined by this method. The purpose of such an abstraction, as was shown earlier, consists in the fact that it enables one to disregard

value, including ethical, aspects when analyzing cognitive activities. As a result, we obtain an oversimplified picture of science, which can be likened to the projection of a three-dimensional object on a plane. Only a person whose knowledge of science is restricted to the material presented in a text-book or in a dry formula included in a scientific article, will identify this projection with the real object.

If the abstraction of a cognitive approach is regarded as reflecting the specifics of the scientific cognition of the world (this is, for example, characteristic of neo-positivism), we are deprived of the possibility to appeal to moral criteria in analyzing science. Obviously, in such a view of science, the question of the scientist's social responsibility is largely removed from the agenda—it is replaced with the logic of impersonal cognitive approach. This logic is an inexorable and blind mechanism which irrevocably stipulates the scientist's cognitive activity. It is not upon the scientist (in fact, not upon any concrete person), but upon this logic that the full measure of responsibility rests.

The above does not mean, though, that the process of scientific development has no inner logic of its own or that objective knowledge of the world is not one of the greatest values towards which the scientist's cognitive activity is directed. It is simply that this logic is realized not outside the scientist, not somewhere above him, but precisely in his activity. Every substantial scientific achievement, as a rule, opens a whole spectrum of new lines of research, which were just guesswork prior to that achievement. It means that the logic of scientific de-

velopment is not so simple or uniform. It provides prerequisites for the scientist's creative activity, but by no means replaces it. Let us once again emphasize that scientific knowledge is not born of an abstract cognitive approach itself, but of a quite concrete scientific activity performed by real researchers and research teams. And it is precisely this human activity, an activity of people, that is the object of ethical assessment.

Thus the dilemma: objective logic of the development of science or social responsibility of the scientist—proves to be incorrectly formulated, since neither of the members of this opposition eliminates the other member. The arguments in favour of opposing them to each other and substituting objective logic for social responsibility, though natural enough at first glance, rely on a certain biassed interpretation of science and scientific cognition rather than on the real situation. This also serves to depreciate widely current arguments such as "If it is not done by me, then it will be somebody else"; because if it is done by me, it is myself (not objective logic, and not somebody else) who will be held responsible.

Characteristically, such argumentation can hardly serve to justify errors in the method of an experiment or in its substantiation. No one is fool proof against errors; yet the person who has committed an error is not guaranteed against criticism. The norms accepted within the scientific community and determining professional relations between scholars, go even further: "'A scholar,' it is said, 'is a man who takes a quarrelsome interest in his neighbour's

work.' Implied also is the complete individual responsibility which rests upon each scholar: he may not excuse himself for an error in his own work by blaming it on a previous error by someone else, since he should have been properly sceptical of the other's work to begin with."[7]

Alongside this dilemma, there is another, which also is often offered in debates on the ethics of science. The place of objective logic is in this case occupied by equally anonymous social forces. It is asserted that science is in itself ethically neutral, while anti-humane applications of its achievements are fully dependent on certain social forces. Such argumentation is largely justified, but in this case, too, the issue of the social responsibility of science and the scientist still should not be removed from the agenda.

Let us consider a concrete example already cited elsewhere in the book. In late 1978, the press informed the public of the appearance of the world's first test-tube baby. The fertilization was effected in a tube, and then the embryo which had begun to develop was implanted in the uterus of a woman who could not conceive in the natural way because of a defect in her genital tract. Louise Brown, the world's first baby born as a result of the technique of in vitro fertilization, is developing normally. Thus, it would seem that the group of British scientists, who have successfully carried out the experiment, should be congratulated with the consummation of their many-year efforts. However, their research work has been all along the topic of heated debates on whether the goals and technique applied in the experiments can

be justified in ethical terms; these debates continue to this day.[8] One can easily imagine what will be the position of the scholars in case the girl develops some serious defect or disorder which can be possibly connected with the extraordinary fashion of her embryonal development.

The French Consultative National Committee on the Ethics of Science Concerned with Life and Health, as it discussed problems arising in connection with the technique of artificial fertilization, stated that it discovered that the technique divides different stages of the process of reproduction. Thus, we are obliged to evaluate separately the legal interests of the patients—would-be parents—as well as the interests of the child conceived by this technique. It also pointed out that society has not yet at its disposal answers to all the questions arising in this connection. As distinct from the traditional way of reproducing human life, involving one man and one woman, third persons are involved in artificial reproduction—donors of the semen and ovum, the woman offering herself for bearing the baby, doctors and mediators, each of whom performs his own set of functions. Of special significance and complexity is the problem of surrogate mothers, since the baby has in fact two mothers in this case—the woman who has agreed to conceive the baby by the artificial fertilization technique using the semen of the husband in a sterile couple, and the suffering barren woman who wishes to care for and bring up the baby thus born.

According to R. Badinter, "in this situation, which is absolutely new in human history, it is not

only our traditional order which is at stake. Endangered are also our concepts about succession, based on the triunity: father-mother-child, or at least on the diunity: mother-child, which is much more important." (R. Badinter, "Conceil de L'Europe (Vienne le 25 mars 1985)", in: *Actes,* Paris, No. 49/50, June 1985, p. 79).

Let us refer to the opinion of the British biologist, Prof. Colin R. Austin, who says that the threat of the misuses of scientific achievements lies not in science, but in the exploitation of science by industry oriented towards profits. Therefore, neither science as a whole nor individual scholars should be held responsible for negative implications of their work or guided by any ethical considerations. The latter concern not the field of research, but the sphere of application of its results.

It is of course true that the exploitation of science in the drive for profits and its misuse in the interest of militarist circles does not depend on science itself but on the system of socio-economic and political relations prevailing in bourgeois society. Yet it does not follow from this that the scientist is absolved of any responsibility for the way the results of his research are used and whose interests they serve. In the final analysis, Austin himself lives and works in a world where the drive for profits brings about inhumane uses of scientific achievements, and he is himself well aware of which social forces can make use of the results of his own scientific investigations. In these conditions, to deny science's responsibility before society and the personal responsibility of each scientist, is tantamount to com-

plicity in the actions of these forces. The scholar who refuses to consider the issue of social responsibility, referring to the operation of anonymous social forces, cannot shift the burden of ethical option and responsibility to these forces, since he pronounces his own choice by the refusal itself, and this act of choice should be subject to ethical assessment. As it is, every scientific advance, irrespective of how it is applied in practice, is a contribution of a concrete scholar or a concrete team, while the social forces themselves operate through the actions of concrete persons.

Here it would be relevant to recall that the Nuremberg Tribunal recognized the responsibility of the physicians and scholars who conducted anti-humane experiments on prisoners in Hitler concentration camps "in the name of scientific progress". Their reference to the fact that they were only instruments in the hands of the Nazi regime, did not eliminate their personal responsibility. In this case, it was a matter of legal rather than ethical responsibility; but that is not to say the experiments they performed were neutral from the ethical point of view either.

The image of science underlying the argumentation cited by Austin, is in many ways similar to that we have considered earlier. In this approach, the cognitive aspect in scientific activity is also opposed to its value and ethical aspects, though emphasis is laid here on the instrumental-pragmatic side, rather than on the truthfulness of scientific knowledge. As a result, if this line of argumentation is logically pursued, scientific research activities prove to be de-

pendent, auxiliary and derivative. As for the scientist himself, if this is the case, he cannot be regarded as a responsible and sovereign person, but turns into an accomplice of the social forces. The supporters of the given stand do not as a rule arrive at such logical conclusion, because it obviously contradicts not only the external but also the internal ethics of science. Indeed, the status and authority of a scholar within the scientific community is primarily determined by his personal contribution to the development of a particular discipline. Hence, he finds himself responsible for what he himself has done. This norm, as is well known, is a powerful stimulus in the scientist's activity.

Thus, we can conclude that in the dilemma, social forces or the responsibility of the scientist, the two possibilities are not mutually exclusive. In this case, too, their cardinal opposition rests on a definite, and again one-sided, interpretation of science and scientific cognition. However, there is no ground, and no intention on our part, to make an absolute of scientists' sense of social responsibility or regard it as omnipotent, since that would also essentially amount to one-sidedness. We only try to point out that social responsibility is one of the inherent, intrinsic realities in the world of science, and that this makes the existence of the ethics of science as a specific scientific discipline fully grounded.

Here is what Academician W.A. Engelhardt, an outstanding Soviet scholar highly sensitive to ethical and humanist problems, has to say on this issue: "There is no doubt that in the face of global problems and crises, scholars will have repeatedly to turn

to their conscience, to appeal to the sense of responsibility in order to find the right road for overcoming the rising threats. And of course, the social responsibility of the world's scientific community, as well as general responsibility, must resolutely oppose all phenomena which cause harmful, disastrous consequences, and must direct scientific quests to remedying the injury science itself could have done if it ignored possible implications of its activities, thus becoming an accomplice in generating certain global problems. The specific form of reaction to serious problems connected with the scientist's responsibility can only be regarded as capitulation, which finds reflection in slogans, such as "counter science" and "counter culture", urging in fact the curbing of the progress of scientific research.

"One can agree that scholars are to a certain extent guilty of the ulcers afflicting and devouring the flesh of contemporary Western society, even if it is expressed in a new form of 'non-interference' on the part of members of the world scientific community. Many of us older scholars remember what sour fruit had the notorious non-interference principle brought in international politics in the days of Munich, when it resulted in World War II. It bears evil seeds when it becomes the norm of behaviour of a scholar.

"The movement for the scientists' collective responsibility should be acclaimed... In the development of this movement we [Soviet scientists. —*Ed.*] see an important form for scientists to manifest their responsibility in times characterized by the emergence of major problems, sometimes assuming a

global scale and involving various aspects of contemporary society."[9]

We have cited this long passage because, in our opinion, it puts the problem of the scientists' social responsibility in bold relief.

Let us, finally, touch upon a third dilemma heatedly discussed in the debates on the ethics of science. An idea is frequently expressed in these debates that the problem of social responsibility only refers to applied research, and not to fundamental investigations. The arguments in support of this idea can be summed up as follows: first, the results and, even more so, possible areas of practical applications of fundamental research, cannot be predicted and second, that all interference in their course and technique violates the principle of free inquiry.

Here are the views of Professor Ernst Chain, British biochemist and a supporter of this position: "Let me first of all state that science, as long as it limits itself to the descriptive study of the laws of nature has no moral or ethical quality... The moral and ethical issues, the questions of right or wrong, arise only when scientific research concerns itself with influencing Nature, and this is, of course, next to describing Nature, its major objective. In discussing moral issues, such as the responsibility of the scientists, we are, therefore, concerned, not with descriptive, but applied, science in its various aspects."[10]

Today such a contemplative interpretation of science looks somewhat outmoded. Thus, the British specialist in the ethics of science, A. Belsey characterizes it as oversimplified, since scientists "cannot set about the descriptive study of the laws of na-

ture", without at the same time "influencing nature". Scientists work in the world actively manipulating material both inorganic and organic. This activity, however true the descriptive research, may require moral apprisal."[11]

What can we say about this viewpoint? It is true that, as a rule, results and applications of fundamental research are unpredictable. Nevertheless it can be assumed with a great degree of certainty that the results of today's basic research will find more variegated uses in the short term, and those uses will not be proof against negative aspects. Though we cannot know for certain what will be the practical results of a particular discovery, we are all well aware that knowledge is a powerful means. Thus, we must try to envisage what is in store for humanity in connection with a particular discovery. Given such an intention, we stand a better chance to see that there may be undesirable effects when it is not yet too late.

As for the right to free inquiry, we should note the following: it is well known that modern basic research usually requires joint effort on the part of large scientific staffs and involves considerable material outlays. This inevitably sets clear-cut limits to the right of free inquiry, irrespective of our will. Of no less importance is the fact that science today is a fully formed and sufficiently mature social institution having a serious impact on society. The idea of unrestricted freedom of research, which was progressive when science had to wage a struggle against the intellectual domination of theology, should not be unconditionally acclaimed today, disregarding

the social responsibility of the scientist which is closely linked with that freedom. We must clearly distinguish between responsible freedom and, as radically different form it, unrestricted irresponsibility.

One can hardly agree without reservations with the point of view formulated by Paul Kurtz, professor of philosophy at the State University of New York at Buffalo: "I would suggest that the right to free inquiry should be taken as a prima facie general principle, which we ought to respect save in exceptional cases... Since some forms of moral opposition can become as tyrannical or fanatical as religious or ideological objections in destroying free inquiry, I would suggest that the burden of proof always be placed on those who would limit inquiry. It is the exception to the principle that needs justification, not the principle itself."[12] Such an approach, however, seems to be absolutely out of the question in certain cases, for example, in experiments on man.

The contraposition of the freedom of research, required by the internal needs of scientific activity, to social responsibility as something which is imposed on that activity from the outside, relies on a narrow interpretation of scientific activity, its motives and means of realization. One cannot but agree with the postulate that science is the search for the truth; but it is precisely a search, i.e. a process which requires efforts rather than mere contemplation. Hence the road to the truth is a scientific and at the some time human activity, which is performed by man as an entity, and not by some of his capabilities or interests abstracted from him.

The issue of free inquiry and of the way it should be understood was a central one in the debate on the socio-ethical aspects of recombinant DNA experiments. Alongside the apologetics of unlimited freedom of research, another, and a diametrically opposite, point of view was also voiced—it was proposed to regulate science in the same way as railway traffic. These are extreme views. There is also a wide range of opinions in between them on the possibility and advisability of regulating scientific investigations, as to who should have the final say in this matter—an individual researcher, the scientific community, or the public at large.

In the opinion of the US biologist, Robert Sinsheimer, for example, there are fields of research today "of dubious merit" and, from the viewpoint of the future of humanity, they should not be conducted at all. He classifies as such work on the isotope separation by lasers, which can make nuclear weapons accessible to terrorists; attempts to establish contact with extraterrestrial civilizations, since the contact with a higher civilization can have a deteriorating impact on our value systems; research into herontology whose findings can bring about considerable ageing of the world's population and in general overpopulation.[13]

Sinsheimer thinks that underlying the evolution of science has been the belief that nature is sufficiently resilient and favourably disposed to our attempts to investigate and dissect it, and that we shall not be able to destroy certain key elements of our protective environment, our ecological niche. Today, he writes, that belief should be put in question and reconsidered.

Dealing with the unpredictability of research results, Sinsheimer presents a sensible and interesting idea that "the unpredictability of a research outcome is not an absolute but is both quantitatively and qualitatively a variable".[14] As a whole, however, his ideas met with criticism in the scientific community. It was pointed out, for example, that banning investigations in the three areas he indicated would mean termination

of a great number of investigations more or less connected with them. Sinsheimer seems to underestimate or ignore the existence of a broad network of mutual links between various areas and lines of research.

In the early 1970s, a questionnaire was offered to 800 scholars, and 77 per cent of them agreed that scientific activities prove to be best organized when the scientists are given as much freedom as possible. Opinions were voiced that a "pure" scientist should not refrain from a discovery because of its social implications, and that no single area of investigation should be closed because society thinks someone to be incapable of using it correctly.

At present, an ever greater number of scientists begin to regard the right to free inquiry not as an absolute right, but as a kind of contract, or agreement between the scientific community and society. They also think that the clauses of that contract can be reviewed in connection with changes in the general situation. Widely current is also a view that freedom of inquiry actually implies not only freedom of thought and speech, but also freedom of action, including an impact on nature and human beings.

We see that an unhistorical approach to the principle of free inquiry and its absolutization are associated with the contemplative interpretation of science as a whole. At the same time, it is clear that the question of freedom of research and the resulting obligations of scientists, is far from having been resolved.

The existence and evolution of science is impossible without certain forms and norms of regu-

lating investigations and scientific activities in general. It is only natural that in the period of advancement of science and its growing interaction with society, the problems of self-regulation and outside regulation, of the ethics of science and the social responsibility of the scientists, come into the foreground. Therefore, it is necessary to consider and improve the existing mechanisms for the self-regulation of research. Researchers should be themselves convinced of the well-grounded nature of all attempts at regulating science. Thus the mutual links involved are bilateral, and a genuine regulation of scientific activities, in which freedom of inquiry and social responsibility of the scientists will be integrated, is possible only in such social conditions when the interests of society and of science do not come into contradiction. However, the principles of democratic control in the name of global interests of entire mankind, its survival and evolution can well be realized before human civilization attains such a state.

This is a concrete, practical task, which confronts the world community. Its fulfilment presupposes an international agreement on the complete range of problems to be tackled by modern science and its practical uses, from peaceful applications of the energy of the atom, genetic engineering and biotechnology to the global problems looming large before humanity and forms and methods to be used for a complex study of man himself. Initial propositions to make that possible were formulated, in particular, in the programme for establishing an international regime for the safe development of nuclear

power engineering, elaborated by the USSR and presented at the special session of the General Conference of the International Atomic Energy Agency, which was held in September 1986. The Conference approved the conventions on the timely information about, and on rendering necessary assistance in case of nuclear accidents. Thus, general problems involved in the ethics of science are coming into contact with practice, with real life. Further effort in this direction should promote the establishment of new ethos of science, new mentality and new, realistic humanism.

NOTES

[1]Max Born, *My Life and My Views*, Charles Scribner's Sons, New York, 1968, pp. 190-91.

[2]*The Programme of the Communist Party of the Soviet Union. A New Edition*, Novosti Press Agency Publishing House, Moscow, 1986, pp. 29-30.

[3]See: André Piatier, "Innovation, Information and Long-Term Growth", in: *Futures*, Vol. 13, No. 5, October 1981, pp. 371-82.

[4]Alvin Toffler, *The Third Wave*, William Morrow and Company, Inc., New York, 1980.

[5]*Microelectronics and Society. For Better or for Worse. A Report to the Club of Rome*, edited by Günter Friedrichs and Adam Schaff, Pergamon Press, Oxford, 1982, pp. 29, 35.

[6]Jacques Robert, "La révolution biologique et génétique face aux exigences du droit", in: *Revue du droit public et de la science politique en France et à l'étranger*, Paris, September-October 1984, No. 5, pp. 1255-1300.

[7]Norman W. Storer and Talcott Parsons, "The Disciplines as a Differentiating Force", *The Foundations of Access to Knowledge. A Symposium*, ed. by Edward B. Montgomery, Syracuse University, Syracuse, New York, 1968, p. 110.

[8]*Science and Morality. New Directions in Bioethics,* ed. by Doris Teichler-Zallen, Colleen D. Clements, Lexington Books, D.C. Heath and Company, Lexington, Massachusetts, 1982, p. 139.

[9]W.A. Engelhardt, "Science, Technology, Humanism", in: *Voprosy filosofii,* No. 7, 1980, p. 88.

[10]Ernst Chain, "Social Responsibility and the Scientists", in: *New Scientist*, Vol. 48, No. 724, October 22, 1970, p. 166.

[11]A. Balsey, "Scientific Research and Morality", in: *The 6th International Congress of Logic, Methodology and Philosophy of Science,* Hannover, 1979, p. 212.

[12]Paul Kurtz, "The Ethics of Free Inquiry", in: *The Ethics of Teaching and Scientific Research,* ed. by Sidney Hook, Paul Kurtz, Miro Todorovich, Prometheus Books, Buffalo, New York, 1977, p. 206.

[13]Robert L. Sinsheimer, "The Presumption of Science", in: *Limits of Scientific Inquiry,* pp. 23-25.

[14]Ibid., p. 31.

Conclusion

We have presented the complicated and acute problems facing the ethics of science as a field of research in the process of formation. They are closely linked both with the evolution of science itself and its interaction with society. The way science is interpreted largely determines how ethical questions involved in science are posed and what methods are used to investigate them.

The key problem in the ethics of science is, in our opinion, that of the social responsibility of the scientists, and the roots and mechanisms of this responsibility. It should by no means be imposed on science from the outside, since it stems from the very nature of scientific activity.

The social responsibility of the scientists is in itself a condition which, though indispensable, is unable to exclude the possibility of the misuse of scientific findings. The problem can only be resolved by the entire course of progressive social development. It would be highly irrational to overestimate the powers at the disposal of science and the scientists in the humanization of advances in science and tech-

nology. It is still less rational, in fact, irresponsible, to ignore the active socio-ethical humanistic stand taken by the scientific community.

New problems and new debates are in store in this newly developing field of research – the ethics of science. Not only the specific sciences with which we have dealt, but also socio-psychological, social and behavioural sciences, pedagogics and the science of culture and man as a personality will be involved. Indeed, the ethics of science as a relatively independent socio-philosophical discipline can have a prospect before it only if concrete situations are investigated which emerge in the entire complex of sciences and if they are considered in close connection with the evolution of human culture as a whole. And this means that the entire set of new problems will expand, and to resolve them scientifically will become ever more difficult. Understandably, there is a broad prospect for philosophers: they will have many topics to ponder over and to hold heated, productive debates.

NAME INDEX

Abdel-Malek, A. – 122-25
Ahmad, A. – 125-27
Andropov, Yu.V. – 182, 190
Ardrey, Robert – 193, 201
Astaurov, B.L. – 207, 208
Austin, Colin R. – 340, 341

Badinter, R. – 339, 340
Baltimore, David – 262, 265, 285, 314
Barnard, Christian – 69
Bayev, A.A. – 184, 249, 251, 267, 272, 283, 284
Beecher, H.K. – 83, 96
Belsey, A. – 344, 351
Belyaev, D.K. – 219, 229, 244, 245
Bennett, William – 255, 283, 284
Bentham, Jeremy – 85
Berg, Paul – 248, 249, 254, 255, 257
Bernal, John – 155
Bilibin, A.F. – 96
Binet, Alfred – 218
Bochkov, N.P. – 302
Bogolyubov, N.N. – 184
Bohr, Niels – 147, 149, 162, 163
Born, Max – 170, 320, 350
Brecht, Bertolt – 122, 123
Brooks, Harvey – 168, 189
Brown, Louise – 338
Bruno, Giordano – 32

Čapek, Karel – 326
Chain, Ernst – 344, 351

Chance, M.R.A. – 195
Chargaff, Erwin – 285, 286, 314
Chrichton, M. – 294
Cohen, Robert – 99, 100
Cohn, Victor – 284
Coleman, James S. – 213
Copernicus, Nicolaus – 32
Culliton, Barbara J. – 69, 96

Daly, Peter – 276, 283, 284
Danin, D.S. – 160, 161
Darwin, Charles – 32, 192, 194, 195, 200
Dawkins, Richard – 199, 200, 242
Dickson, David – 262, 277, 279, 283, 284
Dietl, Hans-Martin – 284, 314
Dostoyevsky, Fyodor – 58, 186
Dubinin, N.P. – 299, 300, 302, 314

Ebling, John – 194, 195
Ebon, Martin – 292-95
Eckberg, Douglas Lee – 218, 244
Edwards, Robert G. – 293
Efroimson, V.P. – 207, 208, 243, 301
Einstein, Albert – 140, 150, 151, 170, 171, 216
Engelhardt, W.A. – 23, 107, 108, 255, 267, 283, 342, 351
Engels, Frederick – 182, 190, 201, 202, 243
Etzioni, Amitai – 213, 214, 243, 310, 311, 315

Fedoseyev, P.N. – 48
Fermi, Laura – 189
Fermi, Enrico – 162
Feyerabend, Paul F. – 59
Fletcher, Joseph – 145, 304-06, 315
Forest, P.H. de – 132-35, 149, 150, 163
Foss, B.M. – 196
Frankel, Charles – 287, 288, 314
Freud, Sigmund – 193
Frolov, I.T. – 95, 145, 189, 190, 242
Fromm, Erich – 182

Gahse, Heinz – 284, 314
Galilei, Galileo – 32, 92, 115, 116, 122, 123
Ganzhin, V.T. – 15
Gardon, J.B. – 293
Gibson, J. – 244
Gilbert, G. – 52
Glass, Bentley – 66, 96
Glazer, Nathan – 213
Goddard, Henry – 218
Gorbachev, M.S. – 48, 96, 145, 172, 185, 189, 190
Graham, Loren R. – 153, 155, 189
Gurin, Joel – 255, 283
Gutteridge, Frank – 79

Haeckel, Ernst – 192, 242
Hahn, Otto – 152, 160
Halsey, A.H. – 234, 235, 245
Hamilton, W.D. – 198
Hare, R.M. – 84, 85, 87
Harwood, Jonathan – 238, 245
Hébert, Jean-Pierre – 223, 226, 244, 245
Hegel, Georg Wilhelm Friedrich – 57, 58, 60, 95
Heisenberg, Werner – 152, 158-60, 189
Heissler, E. – 275
Herrnstein, Richard – 213, 214
Hilts, Philip J. – 277, 284
Hinman, Lawrence M. – 204, 205, 243
Hippocrates – 88
Hupner, R.H. – 249
Huntley, O. – 308
Huxley, Aldous – 248, 283
Huxley, Julian – 177, 201, 243

Jencks, Christopher – 227, 232, 245
Jensen, Arthur – 213, 216-18, 222-25, 227, 228, 230, 231, 234, 235, 243-45
John Paul II – 115, 116
Joliot-Curie, Frédéric – 169-71
Kalaikov, I. – 314

Kamin, Leon J. – 205, 243
Kant, Immanuel – 13, 51, 85, 139
Karpets, I.I. – 314
Kedrov, B.M. – 107
Keldysh, M. – 184
Kelle, V.Zh. – 109
Kennedy, Edward – 261, 262
King, Jonathan – 260, 278
Kipnis, Dorothy McBride – 220, 244
Kirstein, R. – 291
Kovda, V.A. – 184
Kranhold, Hans-Georg – 284, 3145
Krimsky, Sheldon – 163, 189, 253, 283, 284
Kristol, Irving – 213
Kropotkin, P.A. – 192, 242
Kubrick, Stanley – 164
Kudryavtsev, V.N. – 302, 314
Kuhn, Thomas S. – 59, 60
Kurchatov, I.V. – 151, 167
Kurtz, Paul – 346, 351

Lacroix, Michel – 83, 91, 96
Ladriere, Jean – 111, 112
Laplace, Marquis Pierre Simon de – 138
Lawler, James M. – 245
Lazar, M.G. – 15
Lederberg, Joshua – 257, 290, 291, 294, 295
Lektorsky, V.A. – 95
Lenin, V.I. – 30, 52, 57, 60, 64, 95, 132, 180, 182, 202, 243
Leontiev, A.N. – 300, 301
Lesch – 307
Lewis, Andrew M. – 249
Lewontin, Richard C. – 205, 227, 243
Leyman, I.I. – 15
Lifshits, M.A. – 108
Lippmann, Walter – 221
Lloyd, Barbara S. – 217, 228, 244, 245
London, Perry – 81, 96

Lorenz, Konrad – 193, 201
Lumsden, Charles J. – 202-04, 243

Mackinnel, R. – 205
Malinovsky, A.A. – 107, 301
Mamardashvili, M.K. – 108, 302
Margenau, Henry – 98, 99, 144
Markov, V.S. – 110
Marois, Maurice – 185, 186
Martin, Malcolm – 264
Marx, Karl – 22, 37, 42, 48, 52, 54, 56, 58, 59, 64, 95, 143, 145, 175, 179-82, 187, 190
McCarthy, C. – 295
McLuhan, Marshall – 326
Medyantseva, M.P. – 14
Mezhuyev, V.M. – 110
Milgram, Stanley – 81
Mill, John Stuart – 85
Millikan, Robert A. – 148
Moiseyev, N.N. – 184
Monod, Jacques – 59, 103, 104, 141, 144
Montaigne, Michel – 92
Motroshilova, N.V. – 108
Mulkay, M. – 52
Muller, H.J. – 286

Nazarov, K.N. – 301
Neifakh, A.A. – 298-301
Nyhan – 307

Oizerman, T.I. – 107, 108
Oppenheimer, J. Robert – 146, 150, 151, 159, 188

Pappworth, M.H. – 83, 96
Parsons, Talcott – 152, 189, 350
Pascal, Blaise – 141
Pasteur, Louis – 184
Pastushny, S.A. – 145
Pauling, Linus – 170

Pecci, Aurelio – 177
Petrov, M.K. – 95
Piatier, André – 350
Polushin, G.I. – 15
Pontekorvo, B.M. – 107
Potter, Van R. – 83, 96
Przelecki, Marian – 113
Pushkin, Alexander – 5

Rakitov, A.I. – 17
Ramsey, Paul – 286, 287, 314
Reagan, Ronald – 185
Reiter, Johannes – 307, 308, 315
Rifkin, Jeremy – 281, 282
Robert, Jacques – 331, 332, 350
Rockefeller, John – 192
Rogers, Paul – 262
Roosevelt, Franklin D. – 150
Rorvik, David M. – 292, 314
Rose, Steven – 205, 243
Rousseau, Jean-Jacques – 34
Rowe, Wallace – 264
Russell, Bertrand – 140, 169-71
Rutherford, Ernest – 147, 148

Salaine, Roger – 279
Schweitzer, Albert – 144, 145
Shelley, Mary – 263
Shishkin, A.F. – 243, 302
Shockley, William – 214, 217
Shuey, Audrey – 223, 224
Sinsheimer, Robert – 347, 348, 351
Skirbekk, D. – 129-31
Smith, Adam – 206
Snow, C.P. – 25, 48, 147, 188
Socrates – 13, 139, 318
Soddy, Frederick – 148, 188
Solovyov, E.Yu. – 109
Starr, Ringo – 296

Stent, Gunther – 104, 105, 145, 199
Steptoe, Patrick C. – 293
Storer, Norman W. – 153, 189, 350
Strassmann, F. – 152
Supek, Ivan – 117-19
Szillard, Leo – 150, 151, 255

Teller, Edward – 150, 151, 164
Terman, L.M. – 218
Thompson, R. – 331
Toffler, Alvin – 328, 350
Toulmin, Stephen – 59, 155
Tranøy, K.E. – 87
Tribe, L. – 295
Trivers, Robert L. – 198
Tsaregorodtsev, G.I. – 96
Turbin, N.V. – 284

Van Den Daele, Wolfgang – 124, 145
Vasilenko, L.I. – 190
Vernadsky, V.I. – 12, 14
Virchow, Rudolf – 192
Volkenshtein, M.V. – 107, 108

Wald, George – 285
Walters, Le Roy – 308, 309, 315
Watson, James – 257, 264, 295-98
Weber, Max – 154
Weisskopf, Victor F. – 100-02, 105, 144, 147, 188
Weissmann, Gerald – 266, 284
Weizsäcker, Carl – 158-60
Welch, Raquel – 296
Wiener, Norbert – 322
Wigner, Eugene Paul – 150
Wilson, Edward O. – 196-98, 202-05, 242, 243

Young, M. – 244
Yudin, E.G. – 110

SUBJECT INDEX

Alienation – 8, 23, 24, 104, 105, 126, 127, 326, 328
Altruism – 91, 192, 194, 196-201, 206-08
Anti-scientism – 23, 26, 47, 100, 104, 293, 319

Being and consciousness – 203
Behaviour – 59, 93, 102, 105, 110, 132, 135, 141, 143, 155, 194-96, 199, 207, 214, 268, 302, 328, 330, 343
Benefit – 34, 64, 65, 75, 77, 84, 86, 88, 92, 138, 141, 143, 176, 273, 274, 309, 311, 312, 318, 329
Biologicization – 191, 198, 200, 204, 208-10, 237
Biology – 65-67, 74, 102, 111, 144, 191, 193, 196, 205, 209, 226, 249, 260, 262, 270, 272, 276, 285, 291, 296, 305, 310, 311, 323

Choice – 20, 21, 46, 64, 65, 75, 77, 91, 98, 104, 106, 159, 165, 194, 228, 240, 330
Civilization – 99, 122-25, 146, 177, 178, 184, 266, 324, 326, 347, 349
Club of Rome – 201, 328
Code of scientific ethics – 71, 79, 86, 94, 97, 98, 135, 330
– Nuremberg code – 70, 71, 80
– Helsinki Declaration – 71-73, 79
Computer ethics – 327
Conflict – 8, 76, 85, 99, 104, 106, 119, 123, 134, 141
– collision – 8
Conscience – 343
Consequences – 7, 45, 67, 77, 87, 112, 117, 120, 131, 136, 137, 159, 162, 163, 166, 185, 214-16, 229, 241, 248, 253, 266, 296, 298, 300, 304, 311, 319, 321, 324, 339, 340, 343, 345, 347

Contradiction – 6, 8, 9, 16-18, 24, 28, 30, 36, 41, 52, 64, 77, 92, 101, 108, 115, 120, 123, 135, 156, 178, 186, 187, 195, 211, 271, 293, 311, 333, 349
– discrepancy – 105, 108, 118
Control
– of behaviour (modification) – 72, 84, 328
– genetic – 283, 285, 286, 289-91, 303-12
– socio-ethical – 8, 20, 67, 94, 108-10, 115, 117, 121, 229, 266, 274, 276, 310, 349
– legal – 67, 72, 73, 94, 262
Counter-culture – 23, 65
Cybernetics – 61, 247, 322

Dialectics – 9, 16, 50, 52, 60, 61, 99, 103, 131, 178, 208, 210, 225, 312
Dilemma – 76, 78, 93, 106, 116, 146, 157, 167, 173, 188, 270, 337, 338, 342
Distinction – 197, 212-14, 216, 217, 222, 223, 225, 227-30, 232, 233, 235, 239
Dogmatism – 61, 62, 118
Duty – 85, 89, 111

Egoism – 198-200, 204, 206
Elitism – 191, 210, 229, 230, 236
Ends
– and means – 29, 42, 43, 45, 46, 50,'53, 57, 59, 62, 63, 68, 69, 100, 130, 133, 154, 156, 181, 210, 225, 250, 287, 292, 305, 312
– expediency – 56, 65
– end in itself – 63, 117, 181
Escapism – 230
Essential human abilities – 19, 53, 64, 143
Ethology – 195, 196
Ethos – 155, 157, 188, 350
Eugenics – 287, 288, 299, 301-03, 307
– neo-eugenics – 242, 283, 288
Evaluation, ethical – 27, 59, 65, 67, 71, 80, 87, 109, 113, 132, 135, 138, 139, 167, 174, 229, 267, 317, 319, 325, 332, 334, 337, 341, 345

Experiment
– on man – 67-75, 78-81, 83, 90, 91, 110, 115, 141, 312, 313, 346
– on children – 82, 84, 86, 91
– on embryos – 69, 84, 308, 331

Freedom
– of will, of choice – 68, 203, 228, 287, 310
– of research – 34, 116, 133, 134, 140, 187, 229, 246, 262, 268, 271, 287, 312, 313, 344-49
Future – 45, 66, 74, 77, 116, 118, 142, 146, 173, 176-79, 182, 185, 250, 272, 290, 296, 299, 300, 322, 324, 347
Futurology – 323, 326

Genetic determinism – 202, 210, 231, 232, 234
Genetics – 61, 66, 67, 73, 84, 111, 144, 200, 207, 223, 229-31, 234, 242, 247, 248, 274, 290, 293, 299-305, 311, 323
Genocide – 193, 212, 214
Global problems – 23, 44, 119, 136, 146, 173-81, 184, 186, 188, 201, 320, 342, 343, 349
Good and evil – 5, 34, 42, 65, 76, 77, 81, 87, 92, 99, 108, 109, 142, 165, 199, 200, 217, 225, 272, 318, 320, 334
Group, social – 42, 82, 131, 194-96, 220, 222, 234, 235, 239
Guidelines
– of scientific cognition – 18
– socio-ethical – 52, 226, 227, 279, 330
– value – 62

Harmony – 102, 106, 107, 175, 183, 186, 288, 305, 312
Heredity – 197, 208, 213, 217, 227, 232, 300, 302
Humanism – 8, 9, 67-69, 108, 110, 142, 146, 166, 177-84, 187, 188, 201, 289, 326, 350

Ideal – 92, 93, 97, 98, 104, 108, 126, 127, 138, 140, 142, 144, 169, 182-84, 300, 306, 318, 320, 334
Ideology – 19, 34, 105, 123, 149, 223, 305, 326
Imperative, moral – 118, 139, 181
Individual – 27, 67, 104, 114, 120, 122, 131, 194, 195, 221, 222, 230, 232, 234, 235, 240, 297
Informed consent – 70-72, 79-81, 85, 86, 89-91

Intelligence quotient (IQ) – 218-21, 232-40
Interests – 21, 25, 28, 51, 58, 59, 64, 74, 80, 88, 91, 92, 117, 126, 131, 134, 136, 158, 195, 271, 311, 312, 349
Intuitionism – 8., 87, 105, 106

Judgement
– emotional – 332
– moral-ethical – 75, 106, 114, 117, 203, 319
– value – 58, 59, 104, 117, 154
Justification, ethical – 12, 72, 85, 87, 103, 139, 203, 241

Left-wing radicalism – 19, 23

Marxism – 26, 28, 69, 94, 106, 178-84, 187, 188, 203, 204, 270, 288, 298
Meaning of life – 5, 31, 46, 103, 154, 186
Medicine – 37, 66, 67, 87
Meritocracy – 236, 238
Methodology – 10, 25, 27, 61, 98, 119, 136, 208, 226, 227, 241, 316, 334, 335
Motivation – 27, 78, 108, 129, 203, 205, 221

Natural selection – 194, 197, 207, 237, 301
Neutrality, ethical – 92, 98-101, 113, 117, 124, 126, 128, 152, 154, 224, 240, 334, 338, 341
New thinking – 146, 170-73, 350
Nihilism – 65, 94, 138, 141
Norms – 8, 27, 52, 59, 65, 67, 76, 87, 88, 93, 107, 108, 110, 111, 132, 134, 136, 141, 191, 203, 224, 291, 306, 337, 342, 343

Opposition – 10, 55, 59, 135, 178, 209, 235, 289

Paradox – 5, 105, 106, 155
Personality – 8, 23, 62, 69, 72, 74, 84, 89, 92, 107, 114, 124, 186, 209, 230, 237, 238, 306, 308, 342, 353
– manipulation of – 92
Physics – 65, 66, 118, 119, 130, 144, 146, 149, 255, 274, 321
Positivism – 17, 118
– neopositivism – 25, 155, 336

– post-positivism – 59
Principle, ethical – 25, 49, 62, 67-69, 71, 72, 85, 86, 89, 93, 94, 107, 117, 138-41, 169, 207, 304-06, 309, 312
Public opinion – 47, 162, 213, 222, 223, 268, 320
Pugwash movement – 140, 170, 171
Psychology – 66, 98, 197, 234
Psychopharmacology – 67, 72

Race – 214, 216, 217, 219, 222-24, 227, 229, 233, 239
Racism – 191, 192, 210, 213, 214, 217, 224, 229, 230, 236
Responsibility
– social – 29, 35, 36, 41, 47, 97, 101, 102, 108, 112, 116, 117, 120, 121, 129, 132, 133, 135-37, 139, 154, 157-60, 162, 163, 165, 167-69, 174, 186, 223, 246, 247, 253, 255, 265, 269, 270, 279, 294, 300, 310, 312, 313, 320, 321, 327, 330, 336, 337, 340, 343, 344, 346, 349, 352
– moral – 99, 106, 111, 120, 186, 305, 330, 341
– personal – 75, 114, 120, 140, 327, 340, 341
Regulation – 204, 229, 247, 250, 309, 313, 349
Relativism, ethical – 60, 61, 65, 98, 133, 135, 138, 306
Risk – 69, 71, 81, 84, 90, 112, 256-59, 261, 264, 266, 271, 273, 274, 282, 290-92, 307
Rights, human – 67, 71-73, 79, 84, 86, 87, 89, 122, 289, 305, 306, 322, 327, 339
Role, social – 132, 154, 156, 160, 165, 300, 319, 320

Sanction, moral – 195, 318
Scientific community – 27, 58, 105, 132, 133, 163, 313, 337, 342, 343, 347
Scientism – 17, 25, 26, 35, 42, 47, 59, 63, 65, 94, 97, 98, 104, 115, 138, 139, 141, 143, 223, 228, 303, 306
Self-awareness – 25, 35, 36, 40-42, 45, 47, 97, 136, 138, 140, 141, 143, 146, 156, 312, 317, 321
Social-biologism – 191, 197, 202, 204-06, 210, 242, 288, 301
Social-Darwinism – 192, 212, 237
Sociologism, vulgar – 28
Sociology – 10, 11, 129, 182, 316
Socium – 180, 209, 210
Standard, ethical – 27, 67, 69, 72, 132, 134, 191

Status, social – 228, 235-38
Survival – 77, 84, 103, 125, 165, 172, 192, 194, 349

Technocratism – 41, 47, 94, 97, 127, 143, 306
Truth – 31, 57-63, 65, 93, 104, 107, 108, 112, 117, 118, 122, 128, 129, 136, 141, 142, 222, 346

Upbringing – 208, 229, 231, 298, 302
Utopia, utopianism – 125, 137, 141, 164, 178, 182, 201, 275, 288, 289, 292, 326, 328

Value – 8, 31, 41, 53, 55, 58, 59, 61, 62-64, 67, 68, 97, 100, 107, 110, 115, 119, 121, 122, 125-27, 138, 141, 142, 155-57, 159, 186, 193, 201, 202, 206, 226, 266, 297, 305, 306, 326, 336
– system of values – 103, 123, 157, 204, 237, 325, 347
– self-contained value – 28, 34, 62, 133

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